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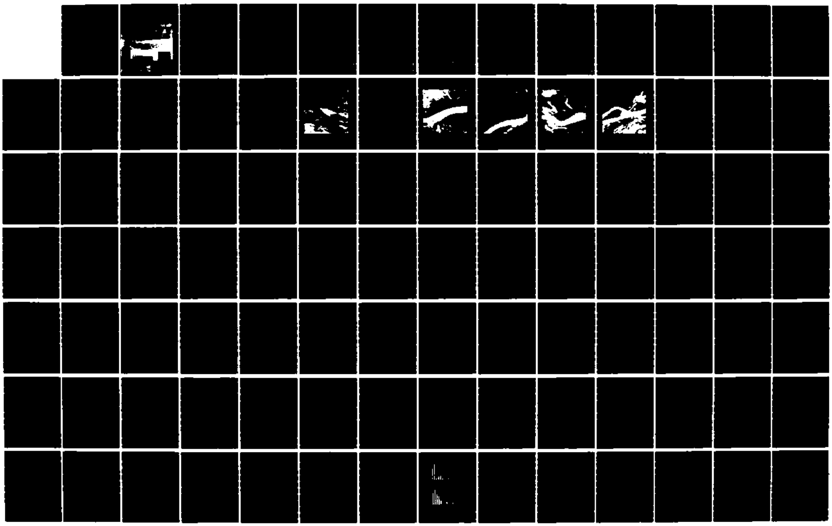

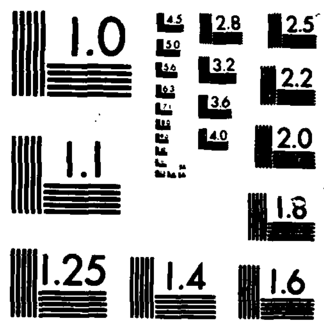

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UNIVERSITY OF WASHINGTON, OFFICE OF PUBLIC ARCHAEOLOGY
for U.S. ARMY CORPS OF ENGINEERS, SEATTLE DISTRICT

ARCHAEOLOGICAL INVENTORY AND TESTING OF PREHISTORIC HABITATION SITES, CHIEF JOSEPH DAM PROJECT, WASHINGTON

J.V. Jermann

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In 1977 and 1978, the U.S. Army Corps of Engineers, Seattle District, contracted with the Office of Public Archaeology at the University of Washington for archaeological inventory and evaluation of cultural resources potentially threatened by a proposed 10-foot pool raise behind Chief Joseph Dam, north-central Washington. Pedestrian reconnaissance of areas not previously subject to resource inventory identified 27 prehistoric sites, bringing the total number of recorded sites in the area to 279. Test excavations were completed at 79 prehistoric habitation sites in order to characterize formal, temporal, and spatial variability in sufficient detail to provide for follow-on management planning. Artifacts and contextual samples recovered from nearly 600 cubic meters of soil matrix in 543 test units demonstrate that the project area was occupied by Native American groups continuously for at least the last 6,000 years, and perhaps longer. Considerable temporal and geographic variation occurs in the cultural assemblage, variability reflecting regional settlement and subsistence patterns. The cumulative database resulting from survey-level investigations includes the first comprehensive large-scale cultural resources inventory in the region, the first series of controlled radiocarbon age determinations from cultural contexts along the reservoir, and the largest assemblage of site samples from the upper Columbia River region. These data provide invaluable research materials for future investigators interested in the evolution of prehistoric cultural adaptations in the Columbia Plateau.

Archaeological Inventory and Testing of Prehistoric Habitation Sites, Chief Joseph Dam Project, Washington

by
Jerry V. Jermann

Principal Investigators

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Final report submitted to the U.S. Army Corps of Engineers, Seattle District, in partial fulfillment of the conditions and specifications of Contract No. DACW67-77-C-0099.

Office of Public Archaeology
Institute for Environmental Studies
University of Washington

1985

ARCHAEOLOGICAL INVENTORY AND TESTING OF PREHISTORIC HABITATION SITES, CHIEF JOSEPH DAM PROJECT, WASHINGTON

ABSTRACT

In 1977 and 1978, the U.S. Army Corps of Engineers, Seattle District, contracted with the Office of Public Archaeology at the University of Washington for archaeological inventory and evaluation of cultural resources potentially threatened by a proposed 10-foot pool raise behind Chief Joseph Dam, north-central Washington. Pedestrian reconnaissance of areas not previously subject to resource inventory identified 27 prehistoric sites, bringing the total number of recorded sites in the area to 279. Test excavations were completed at 79 prehistoric habitation sites in order to characterize formal, temporal, and spatial variability in sufficient detail to provide for follow-on management planning. Artifacts and contextual samples recovered from nearly 600 cubic meters of soil matrix in 543 test units demonstrate that the project area was occupied by Native American groups continuously for at least the last 6,000 years, and perhaps longer. Considerable temporal and geographic variation occurs in the cultural assemblage, variability reflecting regional settlement and subsistence patterns. The cumulative database resulting from survey-level investigations includes the first comprehensive large-scale cultural resources inventory in the region, the first series of controlled radiocarbon age determinations from cultural contexts along the reservoir, and the largest assemblage of site samples from the upper Columbia River region. These data provide invaluable research materials for future investigators interested in the evolution of prehistoric cultural adaptations in the Columbia Plateau.

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Preface and Acknowledgements

The Chief Joseph Dam Cultural Resources Survey Project was sponsored by the Seattle District, U.S. Army Corps of Engineers (the Corps) in order to inventory and evaluate cultural properties imperiled by a 10-foot pool raise resulting from modifications to Chief Joseph Dam. From Fall 1977 to Summer 1978, the Office of Public Archaeology (OPA) at the University of Washington, under contract to the Corps (Contract No. DACW67-77-C-0099), undertook detailed reconnaissance and subsurface testing along the margins of Rufus Woods Lake behind Chief Joseph Dam. As a consequence of these activities, the field team identified 43 previously unrecorded historic and prehistoric sites and completed test excavations at 79 prehistoric habitation sites. Information resulting from these investigations was used to develop management recommendations for the future treatment of cultural properties at the project (Jermann et al. 1978).

This report describes the results of inventory and evaluation efforts for prehistoric sites within the project area. It is one of two descriptive reports issuing from survey-level investigations; the other document (Thomas et al. 1984) details baseline information about historic properties at the project. Originally, this report was issued in draft form in 1981 (Leeds et al. 1981). Because Corps review determined that the document required extensive revision, I completely rewrote the report to incorporate Corps comments and to include the most up-to-date results of all data analyses.

This report is the result of the collaboration of many individuals and agencies. Throughout the contract, the Coprincipal Investigators were Drs. Robert C. Dunnell and Donald K. Grayson, both of the Department of Anthropology at the University of Washington, and Dr. Jerry V. Jermann, Director of the Office of Public Archaeology at the University of Washington. Dr. William S. Dancey of Ohio State University served as Project Supervisor during the two field seasons and prepared preliminary drafts of several report chapters before returning to Columbus to resume his teaching duties in Fall 1978. Dr. Leon L. Leeds completed the initial draft of the report between Spring 1980 and Summer 1981.

Three Corps staff members made major contributions to the project. Dr. Steven F. Dice, Contracting Officer's Representative, assisted with much-needed logistic support and provided encouragement through all phases of our investigations. Corps archaeologists David A. Munsell and Lawr V. Salo worked tirelessly to ensure the success of the project from its initial planning stages through fieldwork, analysis, and report preparation. Mr. Munsell provided particularly valuable guidance during the initial stages of the project and was largely responsible for developing strong ties between the Colville Confederated Tribes and our staff, relationships that were essential to this undertaking. Mr. Salo reviewed the various versions of project reports and provided invaluable editorial assistance and research advice.

We were fortunate to have the generous support and cooperation of the Colville Confederated Tribes throughout the entire term of the project. In particular, the assistance of the Tribal Business Council and the History and Archaeology Office were invaluable to the success of the project. We owe special thanks to Mr. Andy Joseph, representative from the Nespelem District on the Business Council, and to Ms. Adeline Fredin, Tribal Historian and Director of the History and Archaeology Office. Both acted as liaison between the Tribes and the project and did much to convince appropriate federal and state agencies of the importance of our work for understanding the region's cultural heritage. They helped secure land and services for the project's field facilities as well as assisting us with the establishment of a program to train tribal members and other local residents as field excavators and laboratory technicians. Beyond this, their hospitality and enthusiasm were unflagging; they made our stay in the project area a most pleasant and culturally enriching one. In return, I offer my sincerest thanks to all the members of the Colville Confederated Tribes who have supported our efforts, and to Andy and Adeline, in particular, for their kindness and friendship.

As principal author of this report, I take full responsiblity for its contents. Nevertheless, what is offered here represents only the final step

of a collaborative process that is analogous in many ways to the integrated community of people whose physical traces were the focus of our investigations. Some, by dint of hard labor and archaeological training, recovered those traces from the earth; others processed and analyzed those remains; and still others manipulated the data or wrote, edited, and produced the reports. Each of these individuals was part of a research community that helped bring this project to term.

Finally, a few comments are in order concerning report typography and layout. With the exception of the few photographs, artifact illustrations, and maps, the entire manuscript was prepared and printed on the author's Apple® Macintosh XL™ computer and LaserWriter printer. Use of this hardware and associated software packages (e.g., Microsoft® Word, Chart, and Multiplan®) made production of the report a pleasure.

The cover photograph, a view of the Douglas County bank from 45-OK-2A, was taken with infra-red film by Larry Bullis and also printed by him. The cover layout was designed by Bob Radek.

1. Introduction

Background and Project History

Project Description

On March 22, 1976, the U.S. Army Corps of Engineers, Seattle District, began activities associated with modifications to Chief Joseph Dam that involved adding 11 power generation units to the 16 units then in operation and raising pool operational levels 3 meters (10 ft) to 291 meters (956 ft) above mean sea level. At that time, the dam project, originally authorized as Foster Creek Dam and Powerhouse under the River and Harbor Act of July 24, 1946 and redesignated as Chief Joseph Dam under the River and Harbor Act of June 30, 1948, consisted of the dam and powerhouse, storage and construction facilities, switchyards, recreational facilities, Resident Engineer offices, several kilometers of access roads, and 3,997 hectares (9,872 ac) of land. These facilities are located in north-central Washington along the Columbia River approximately 877 kilometers (545 mi) upstream from its mouth and extend more than 72 kilometers (45 mi) upstream. Construction of additional power units and the associated pool raise were accompanied by a variety of activities:

- Adding approximately 1,526 hectares (3,770 ac) to project lands, for a total of 5,523 hectares (13,642 ac);
- Structurally modifying the dam and powerhouse;
- Constructing haul roads and storage and staging areas;
- Relocating 2.3 kilometers (1.4 mi) of Douglas County Road No. 321; and
- Excavating borrow pits and developing recreation and wildlife management areas.

The Survey Program

Most construction at the project occurred in the immediate vicinity of the dam, an area that was changed considerably by the original construction of Chief Joseph Dam in the early 1950s. Consequently, few, if any, impacts to the natural or cultural environment were expected to occur as a direct result of modifying the powerhouse or associated facilities. The projected pool raise, however, would inundate approximately 285 hectares (700 ac) along 170 kilometers (106 mi) of the Rufus Woods Lake shoreline, and substantial changes would occur in local topography as landforms stabilized to the new operational regime. Of particular importance in this regard were the numerous prehistoric and historic cultural properties that occur along this shoreline. A Corps in-house cultural resources inventory completed in winter and spring 1976 that encompassed less than 60 percent of the lake margin identified 215 previously unreported sites. Together with the 62 sites identified by previous investigators, 277 sites were known to occur: 235 of prehistoric or protohistoric age and 42 of historic period association. Based on this partial inventory, the Corps archaeologists estimated that as many as 350 to 400 sites occurred at the project (Munsell and Salo 1977:18).

Recognizing their responsibility under various statutes, regulations, executive orders, and guidelines to inventory and evaluate cultural resources under their jurisdiction and to preserve and protect important resources that might be lost as a consequence of their actions, the Corps decided to engage outside expertise to assist them with their management needs. On July 11, 1977, the Corps invited the Office of Public Archaeology (OPA) at the University of Washington to submit a proposal for cultural resources survey at the project (RFP DACW67-77-R-0020). As stated in the accompanying Statement of Work (SOW), the goals of the survey were

- To inventory the cultural resources on all project lands for planning purposes;
- To record all exposed prehistoric and historic cultural resource sites in the project primary impact areas;
- To determine their functional and temporal character in order to evaluate their significance according to National Register Criteria; and

- To develop a management plan for the salvage and/or preservation of significant resources.

OPA subsequently submitted a proposal on August 8, and the Corps issued a formal contract (DACW67-77-C-0099) on September 15, 1977. Reconnaissance and testing efforts began on September 19, and continued until approximately December 1 with a staff of about 30 individuals. As a consequence of this field program, reconnaissance of all project lands was completed with the addition of 44 sites to the inventory, subsurface testing was completed at 27 prehistoric sites, and mapping and documentation were completed at all historic period sites.

Although the 1977 field season saw considerable progress toward the goals of the survey program, additional work was needed to evaluate the numerous prehistoric habitation sites that would be inundated or eroded by increased reservoir operating levels. Consequently, the Corps issued a request to the University of Washington on April 14, 1978 for continued survey-level investigations. The University filed its proposal for renewed work on April 19, and a study team that included approximately 60 personnel was dispatched to the reservoir on May 1, 1978. During the next two and one-half months, OPA personnel completed test excavations at 51 prehistoric sites. In addition, Corps staff archaeologists discovered and recorded two sites -- both of these were rockshelters that contained habitation debris, one of which also included several pictographs.

The Mitigation Program

Following the completion of survey-level field investigations, the Corps entered into a contract (DACW67-78-C-0106) with the University of Washington on July 31, 1978, for the documentation, excavation, analysis, and reporting of important cultural properties that would be destroyed as a consequence of project construction and operations. Onsite data recovery began that same day, less than two weeks after the termination of survey-level field efforts. Fieldwork at 18 sites was carried out between August 1978 and August 1980; laboratory processing and analysis and report preparation efforts were initiated concurrently and continued uninterrupted for the next several years.

In late February 1981, the Corps closed the gates at Chief Joseph Dam, and the Columbia's waters began their rise to the new operating level. For those of use who had lived and worked along the river for the prevous three years, this was a time of loss and sadness: loss because the sites and landforms we knew so well were no longer to be seen; sadness because we soon would be leaving this place we had come to call home.

Tribal Relations

One of the most important aspects of the Chief Joseph Dam Cultural Resources Project is the relationships that were established between the project and the Colville Confederated Tribes, whose reservation encompasses the north shore of Rufus Woods Lake and whose ancestors lived along this reach of the Columbia Rivers. These relationshps took many forms, both formal and informal. Before the University of Washington's involvement with the project, Corps archaeologists consulted with the Tribal Business Council and individual tribal members about appropriate treatment of heritage values potentially threatened by project operations. These contacts were greatly expanded upon during the survey and mitigation phases.

During 1977 survey-level investigations, I met with the Business Council to explain the nature of the Corps' proposed action and the purpose of our investigations in relation to the Chief Joseph Dam Project and to enlist their aid on behalf of our efforts. The Council subsequently passed a resolution supporting efforts to preserve and protect heritage sites within the project area.

Tribal support for the program took on even more tangible forms with 1978 survey-level efforts, support that was to continue throughout the remainder of the project. These included both facilities and personnel. Because housing was at a premium in the reservoir area, we sought the assistance of the Tribes. In response, they developed a parcel of land upon which to house our facilities and installed water, sewage, and electrical systems on the property. For our part, we instituted a program to employ and train tribal members. We recruited potential employees by advertising in local newspapers and placing notices at the Tribal Center. Respondents were interviewed by both project supervisory personnel and the Tribal Historian. In all, more than 50 tribal members were hired during the course of the project, and the tribal trainees made important contributions to the success of our efforts.

Beginning first in late fall 1977, the Tribes invited project staff to participate in reburial

ceremonies for skeletal remains that were recovered as a consequence of archaeological excavations in the region or that were found eroding along the river margins. This program, which was coordinated by Dr. Roderick Sprague of the University of Idaho under Corps sponsorship, gave us an opportunity to meet tribal members outside the workplace. In addition, throughout the project, we extended invitations to the Business Council and the Council of Elders to tour our facilities and sites under investigation. Their many visits kept us constantly aware of the importance of our efforts to the local community.

In October 1984, the Colville Confederated Tribes received all artifacts and records resulting from Corps-sponsored cultural resources investigations associated with the Chief Joseph Dam Project. These materials will be housed in the Tribes' own repository, where they will provide access to the collections for future archaeological research.

Report Scope and Format

This report details the results of survey-level investigations for prehistoric habitation sites at the project and is one of three documents resulting from the Chief Joseph Dam Cultural Resources Survey Project. The other two provide descriptions of historic period cultural properties (Thomas et al. 1984) and the cultural resources management plan for the project (Jermann et al. 1978).

The narrative is largely descriptive; mitigation program findings confirm that artifact and areal samples resulting from the survey program are too small to attach great interpretive or synthetic significance to findings reported here (Campbell and Jaehnig 1984). Nevetheless, where trends in the data appear particularly strong or are known to be corroborated by later investigations, I have tried to highlight them. At the same time, I must caution the reader to keep the nature, scope, and goals of the project in mind when approaching this work. Because survey-level investigations had to be completed within a limited time in order to initiate an impact mitigation program that had a reasonable chance of success, our efforts focused on the identification of cultural properties warranting follow-on management treatment. Thus, test excavations largely sought to establish the presence or absence of subsurface cultural deposits, to determine the general nature of temporal variability at each property, and to provide preliminary estimates of formal and functional variability within and among sites. Definitive characterizations of site age, content, and structure had to be left to the salvage data recovery phase.

The format of this report is relatively straightforward. Following a brief consideration of the environmental and cultural contexts of the project area, I describe the conduct of field and laboratory investigations, placing particular emphasis on the strategic and tactical decisions that conditioned the resultant data base and on our efforts to record project data in consistent, easily accessible formats for use by future researchers. In presenting the results of our investigations, I first discuss the nature of formal variability in the data assemblage within technological, functional, and stylistic frameworks. This is followed by a consideration of temporal variability within and among sites. Finally, I take up the matter of geographic variability as expressed in the spatial distributions of technological, functional, and stylistic classes along the reservoir.

Several appendices are included to provide backup data for discussions contained within the main body of the report. One of these (Appendix A) contains descriptive information about the physical and cultural characteristics of each tested site. These data are presented in the form of *Resource Fact Sheets*, which are thumbnail sketches that readers may find particlarly useful for gaining an immediate appreciation of the nature of each resource. The other appendices typically contain detailed descriptive data that, although of possible future research interest, are not central to understanding interpretations or conclusions contained in the narrative report.

2. Environmental Context

The project area is in the Big Bend region of the upper Columbia River and includes the floodplain and lower terraces between approximately RM 545 and 590 (Figure 2.1). This area once was occupied by hunter-gatherers who ranged from the banks and escarpments of the Columbia River canyon to the Columbia Plateau and Okanogan Highlands, at least 100 kilometers to the north and south of the valley proper (Ray 1932; Spier 1938). The sections that follow summarize physical and biological aspects of the regional environment that likely influenced the settlement and subsistence patterns of the area's aboriginal inhabitants.

Physiography

The Big Bend region is characterized by a high degree of physiographic variation. To facilitate its description, we subdivide the region into four biophysiographic zones: the floodplain (I), the canyon of the Columbia River (II), the basaltic Columbia Plateau (III), and the granitic Okanogan Highlands (IV). These zones occur in close proximity to one another (Figure 2.2), and all doubtless were used by the region's prehistoric inhabitants because of the varied suites of resources they offered. Figure 2.3 shows the elevational patterning of these zones at three locations within the project area.

Zone I

The floodplain of the Columbia River (Zone I) includes the river, its beaches and bars, and lower terraces that were eroded by river action or built-up by overbank deposits during postglacial times. In general, the pre-dam floodplain was dominated by a relatively narrow, rapid river of high volume that flowed over bedrock between sedimentary bluffs of varying elevation. Along the downstream portion of the project area, where the valley is broadest, sparsely vegetated beaches of annually flooded sands and gravels bordered the river. Along the upper half of the area, low-lying terraces of glaciolacustrine sediments were inundated only during infrequent peak floods. Pre-dam aerial photographs show that deltas, bars, and cut-off meanders were relatively rare (Figures 2.4 to 2.7). Rufus Woods Lake now covers most of this part of the floodplain.

Although situated close to the river, the terraces that stand above the sand and gravel banks are arid. They are composed of well-drained silts and sands that exhibit little soil development. Few of the draws and valleys that dissect the floodplain contain perennial watercourses; however, the bottoms of most draws remain moist during much of the year. Away from the river, lower terraces are mantled by alluvial fans, colluvium, and rock slides from the canyon walls.

Zone II

The physiography and geology of the canyon of the Columbia River (Zone II) are the most varied in the project area. At lower elevations along select reaches of the river, broad, flat terraces occur along both sides of the canyon. Depending upon their elevation and orientation to the river, such flat lands and deep sediments provide ideal locales for habitation sites as well as the best circumstances for preserving physical evidence of such occupations. These terraces are dissected by many draws: some deep and straight, others more shallow and meandering. Although few of these features contain perennial watercourses, their shallow, moist soils support a variety of plants that attract abundant animal life.

Where the original canyon was narrow, terraces have been washed away, and towering bedrock bluffs rise from the river's edge. Stepped basalt escarpments characterize the canyon's south rim and occur in select areas on the north side of the river, such as along the eastern margin of the Nespelem Valley and the north side of the canyon west of the Omak Trench. High along these rims at elevations just above and below 610 meters (2,000 ft), basalt vesicles and contact zones contain deposits of common opal, jasper, and chalcedony, which are materials commonly found in project area prehistoric sites. Massive basalt lag blocks and glacial erratics also are common along certain reaches of the river.

The late Pleistocene glaciofluvial events that were largely responsible for the deposits and landforms of Zone II are complex and as yet not understood in detail. Geomorphological studies undertaken as part of the Chief Joseph Dam Project do suggest, however, that the canyon had essentially achieved its current configuration by

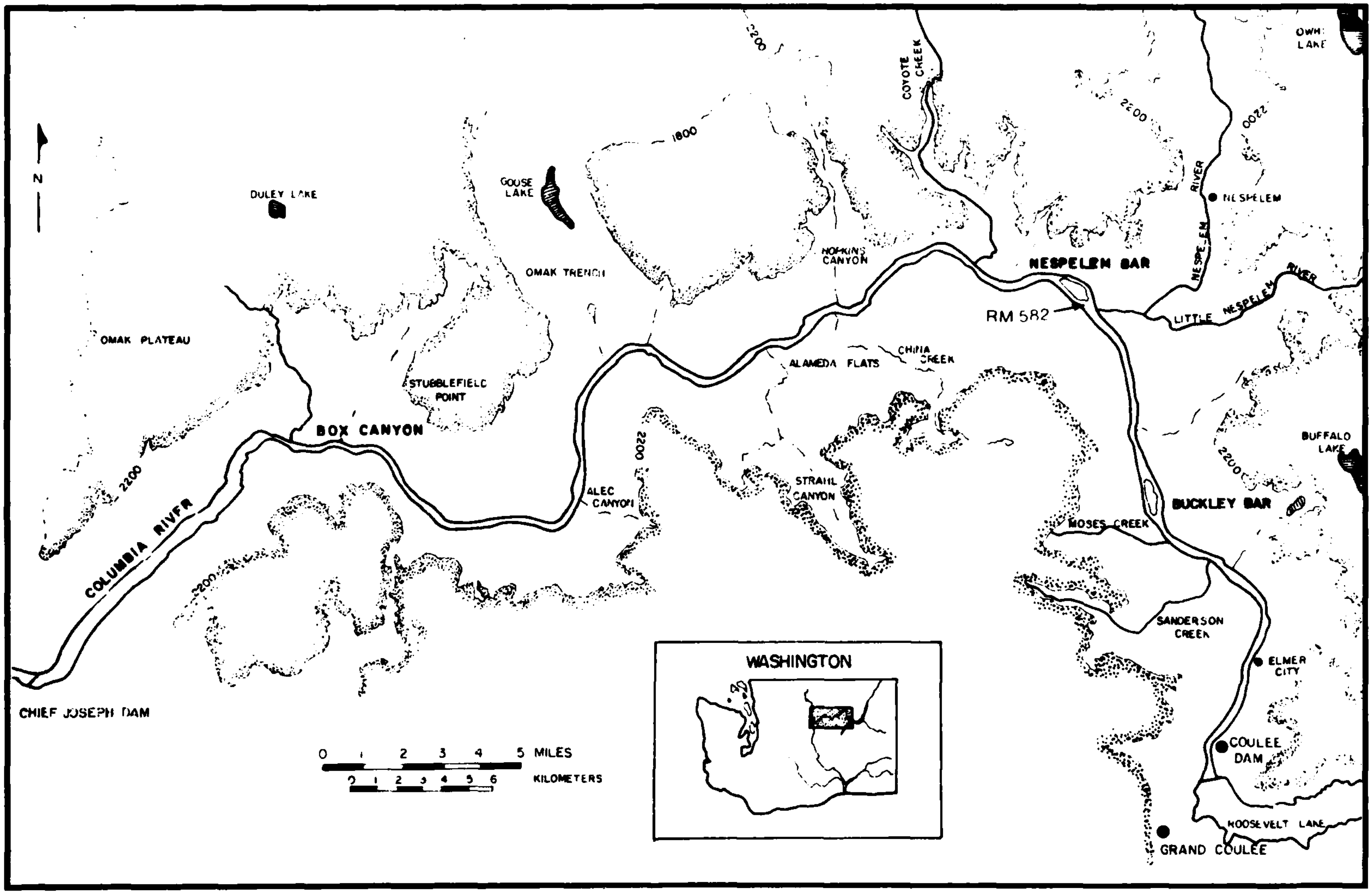

Figure 2.1. Major landforms in and around the Chief Joseph Dam Project area.

Figure 2.2. High oblique, Corps of Engineers air photo (June 1978) showing some of the physiographic features discussed in text.

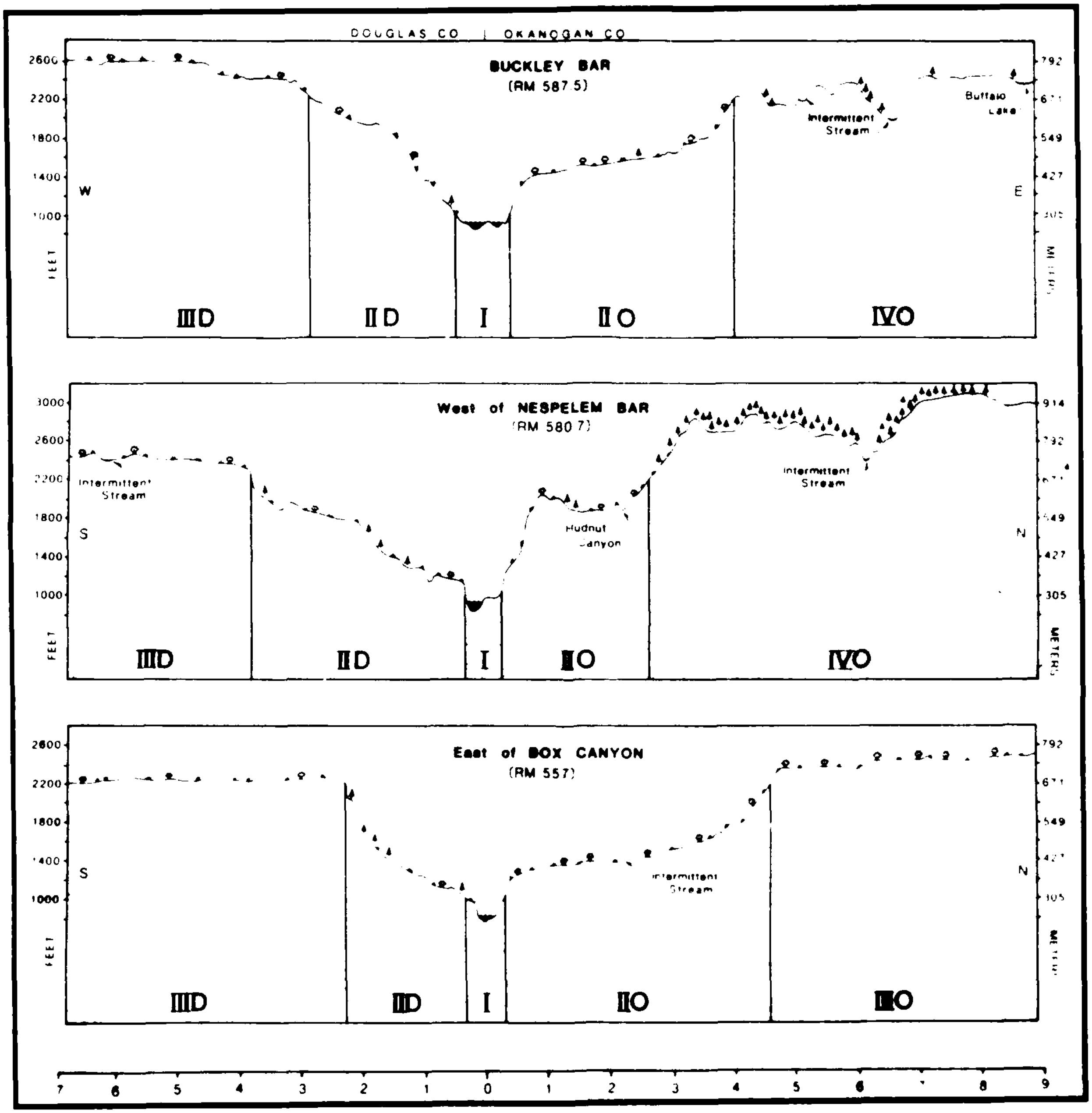

Figure 2.3. Project area biophysiographic zones along three transects (D and O indicate Douglas and Okanogan counties).

Figure 2.4. Pre-dam and post-dam (dashed line) river levels at RM 547, just upstream from Chief Joseph Dam.

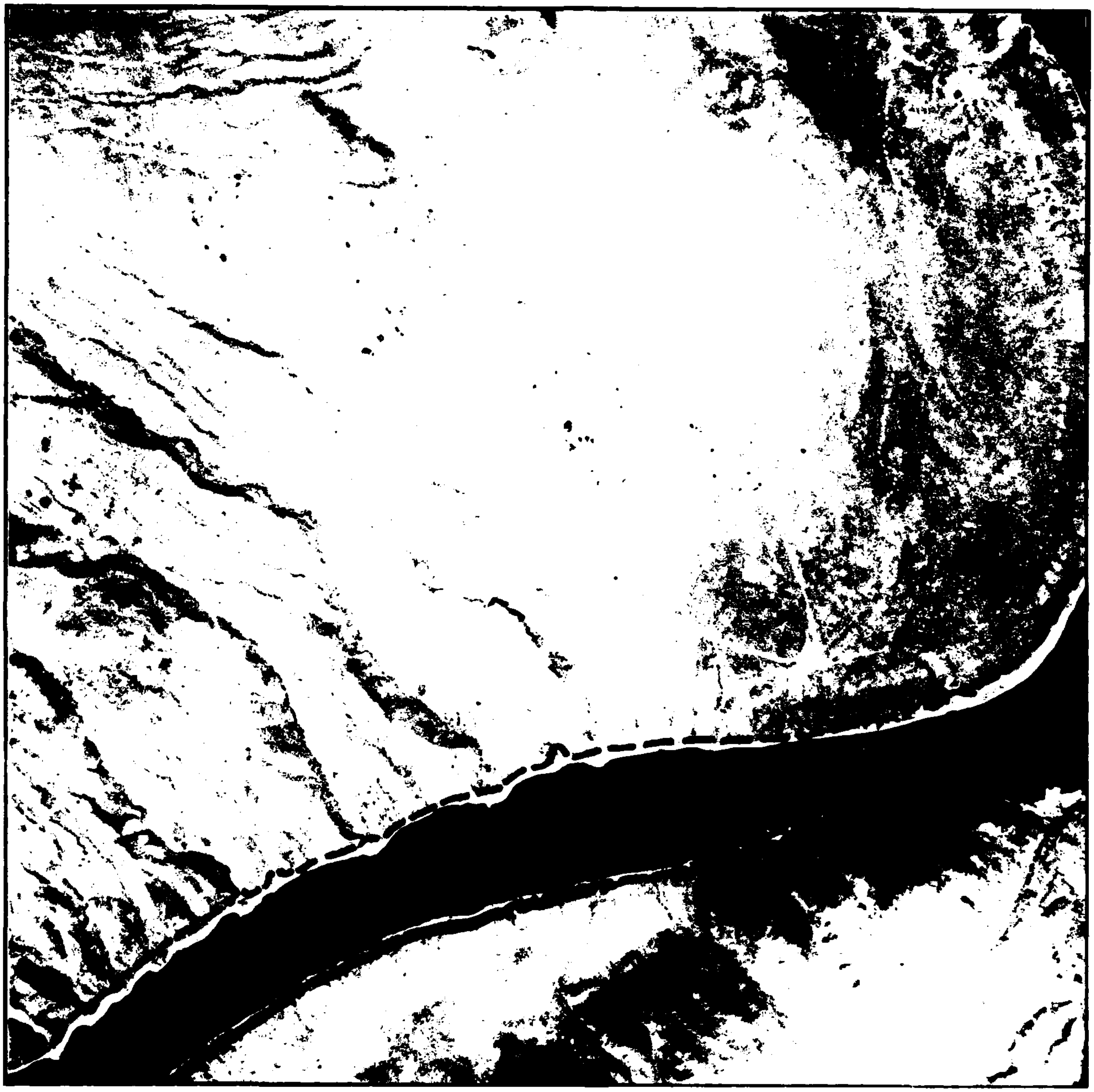

Figure 2.5. Pre-dam and post-dam (dashed line) river levels at Gaviota Bend (RM 562).

Figure 2.6. Pre-dam and post-dam (dashed line) river levels at Mah-Kin Rapids (RM 573).

Figure 2.7. Pre-dam and post-dam (dashed line) river levels at the mouth of the Nespelem River (RM 582).

at least 7,000 B.P., and probably much earlier (Hibbert 1984). Soils and depositional matrices in floodplain and alluvial fan deposits also indicate that no radical changes of depositional regimes during the last 6,000 years (Neal Crozier, personal communication). Because the Columbia's terraces in this area are believed to have been cut in rapid succession before the advent of human occupation, they are not useful for constructing regional cultural chronologies.

Zone III

Zone III, the Columbia Plateau, includes all the area south of the Columbia River escarpment and the Omak Plateau, the area on the right bank that is west of the Omak Trench and east of the Okanogan River valley. Beyond the Columbia River canyon rim, the land surface is shallowly dissected and gently undulant; occasional low basalt mesas that are aproned with talus deposits dot the landscape. The average elevation is 670 meters (2,200 feet). Soils generally are thin and rocky, although the shallow heads of deeper valleys that cut the escarpment have thicker alluvial deposits and moderate soil development. Near the project area, the surface of this zone is dotted with numerous, small pothole lakes of glacial origin. Where such features occur on the Omak Plateau, many are saline.

The Grand Coulee and Moses Coulee, vast canyons deeply cut into basalt and granite, are two of the most important and dramatic landforms on the Columbia Plateau. They generally run north-south, perpendicular to the Columbia River. Both occur to the south of the project area and were formed during the late Pleistocene when vast floods swept down the Spokane and Columbia rivers beyond the nose of the resident glacier (the Okanogan Lobe) into the lower Columbia region. This cataclysmic series of floods gave modern-day eastern Washington its characteristic channeled scablands. Moses Coulee is believed to predate Grand Coulee, and both no doubt provided convenient north-south travel routes for the region's prehistoric residents.

A massive shield of granitic bedrock, known as the Colville Batholith, occurs immediately north of the Columbia River in the project area. It was formed during the early part of the Late Cretaceous by underground crystallization of large volumes of molten rock (McKee 1972). The batholith extends well beyond the north and west margins of the project area and includes the Tonasket gneisses. Several acidic deposits of Cretaceous and early Tertiary ages intrude into the feature. The Columbia River runs on a bed composed entirely of these crystalline basement rocks. Outside the immediate river canyon, the basalt-granite contact zone generally lies above 1,800 meters (5,095 ft). The south rim of the canyon is basalt of Miocene age, as is the north rim upstream of the Omak Trench. A later interbed of middle Miocene age is composed of flat-lying, well-bedded fine sandstones and siltstones (Swanson and Wright 1978).

Zone IV

The Okanogan Highlands that comprise Zone IV are a deeply dissected tableland that have an average elevation between 600 and 900 meters (2,000 - 3,000 ft); however, peaks become progressively higher to the north. Moses Mountain, which is 1,970 meters (6,000 ft) in elevation, is less than a day's walk from the river. These are relatively ancient mountains that are broad and well-rounded, reflecting a fairly mature stage of erosion.

Except for the Columbia River itself, relatively little surface water occurs in the project area; however, Foster, China, Sanderson, Stahl, and Tumwater creeks are perennial minor streams. Because of its heavy snowfall, the Highlands is the area's major watershed. Nespelem River, Little Nespelem River, Coyote Creek and other dependable water sources occur there.

Although bedrock in this zone is composed mainly of acidic intrusives (quartz monzonite - quartz diorite) of the granitic Colville Batholith (Pardee 1918), quartzite, greenstone, shale, limestone, marble, and chert occasionally are found in glacial outwash and tills in the uplands as well as in flood deposits along the floodplain.

Climate

The climate of the Columbia Plateau is semiarid (Daubenmire 1970). During the summer, moderate winds blow from the north and clear skies prevail: days are warm, and nights cool. During the winter and early spring, storm fronts from the north Pacific bring overcast skies and southerly winds. Because such marine air masses lose most of their moisture as they cross the Olympic and Cascade mountains, overall precipitation in the project area is slight. The mean July temperature in Nespelem is 21°C. Winter temperatures, which are moderated by marine air flow, are relatively mild; the mean January temperature in Nespelem is -4°C.

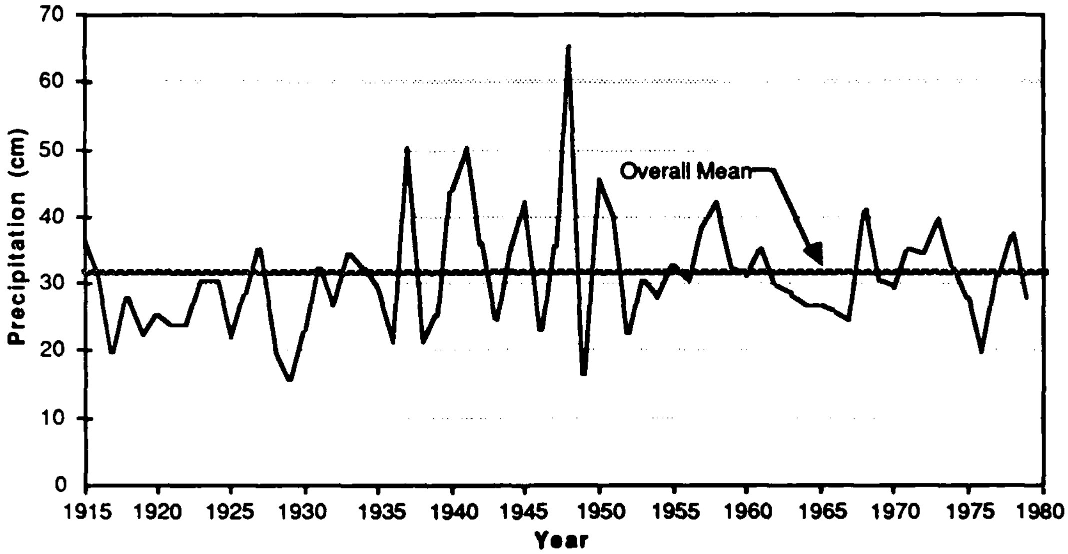

Figure 2.8. Mean annual precipitation at Nespelem, 1915-1980. (Adapted from data compiled by the Colville Confederated Tribes)

Elevation has a major effect on both temperature and precipitation in the area. Data gathered at Grand Coulee Dam and Nespelem between 1964 and 1973 indicate that annual precipitation increases as much as 5 centimeters (2 inches) per 300 meters (1,000 ft) of elevation. The first killing frost occurs as much as three weeks earlier in the Highlands than on the floodplain. Snows are much heavier and accumulate more in the Highlands, and spring thaws in the uplands may be as much as a month later than along the river.

The semiarid, steppe nature of the project area is expressed by the seasonal pattern of precipitation and its large year-to-year fluctuations. Most precipitation falls from November to January in the form of snow; however, at lower elevations both snow and rain evaporate quickly. Data gathered at Nespelem between 1915 and 1980 indicate that dry and wet years tend to alternate (Figure 2.8). Because vegetation in semiarid regions is sensitive to even relatively small changes in precipitation, the abundance of flora and fauna in the project area may vary considerably from year to year. Nevertheless, these are short-term, moderate variations and are not necessarily indicative of long-term trends. Therefore, the significance for hunter-gatherers of vegetation and climate changes during the past several thousand years that have been hypothesized on the basis of pollen cores taken from Goose Lake (Dalan 1984a; Nickmann and Leopold 1984) is not currently known.

Vegetation

Descriptions of vegetation in the project area's four biophysiographic zones are based on studies by Daubenmire and Daubenmire (1968), Daubenmire (1970), and Erickson et al. (1977). Sufficient information exists to present a general view of the area's constituent plant communities and their associated species (Table 2.1). The spatial distributions of biophysiographic zones and associated plant communities along an 8 kilometer transect near RM 582 are displayed in Figure 2.9. The transect runs northwest - southeast, bisecting Mount Iams south of Panama Canyon in Okanogan County and crossing Bissell Flat along a line toward Black Lake in Douglas County.

In general, the project area and its environs provide a diverse variety of roots, berries, nuts, seeds, reeds, and mosses that were used by historic American Indian peoples and that undoubtedly were used prehistorically. In addition, timber, in the form of driftwood, probably was salvaged from along the river. Zone II is the richest for collecting edible plants and other materials. The bases of rockfalls and talus slopes support a variety of shrubs prized for their fruits. Serviceberries, rose hips, cherries,

Table 2.1
Location and Dominant Vegetation of Habitats in the Project Area (adapted from Erickson 1980).

Habitat Type	Dominant Vegetation	Zone	Physiography
Steppe			
Shrub-steppe	Sage *(Artemisia tridentata)* Bunch grass *(Agropyron spicatum)* Bitterbrush *(Purshia tridentata)*	Zones I and II	Open terraces and hillsides
Grass-steppe	Bunchgrass *(Festuca idahoensis, Poa sandbergii)* Sage *(A. tripartita, A. rigida)*	Primarily Zone III and upper parts of Zone IIL	High terraces and Plateau
Rock	Bunchgrass *(A. spicatum)* Western virgin's bower *(Clematis ligusticifolia)* Mockorange *(Philadelphus lewisii)*	Mosaics in all zones	Steep slopes (north-facing in Zone I)
Rockland	Balsamroot *(Balsamorhiza sagittata)* Nine-leaf lomatium *(Lomatum triternatum)* Sage *(A. tripartita, A. tridentata)*	Mosaics in Zones I, II, and III	Open terraces and hillsides
Macrophyllous Vine and Shrub	Serviceberry *(Amelanchier alnifolia)* Mockorange Western virgin's bower	Mosaics in Zones I, II, and III	Seasonally moist draws
Broadleaf			
Broadleaf Tree Over Shrub	Hawthorn *(Crataegus columbiana)* Cottonwood *(Populus trichocarpa)* Water birch *(Betula occidentalis)* Ryegrass *(Elymus glaucus)*	Mosaics in all zones	Draws with perennial flowing springs
Coniferous Tree Over Shrub	Pine *(Pinus ponderosa)* Serviceberry Mockorange Bitterbrush	Mosaics in Zones I and II	Steep, north-facing slopes
Coniferous and Broadleaf Tree Over Shrub	Pine Water Birch Mockorange Snowberry *(Symphoricarpos albus)*	Mosaics in Zones I, II, and IV	Draws with perennial flowing springs
Coniferous			
Coniferous Forest	Douglas fir *(Pseudotsuga menziesii)* Pine Bitterbrush Squaw currant *(Ribes cereum)*	Zones I, II, and IV	Widespread in Zone IV; steep, north-facing slopes in Zones I and II
Riparian			
Riparian	Horsetail *(Equisetum arvense)* Dutch rush *(E. hyemale)* Tule *(Scirpus acutus)* Sedges *(Carex spp.)*	Patches in all zones	Surface water

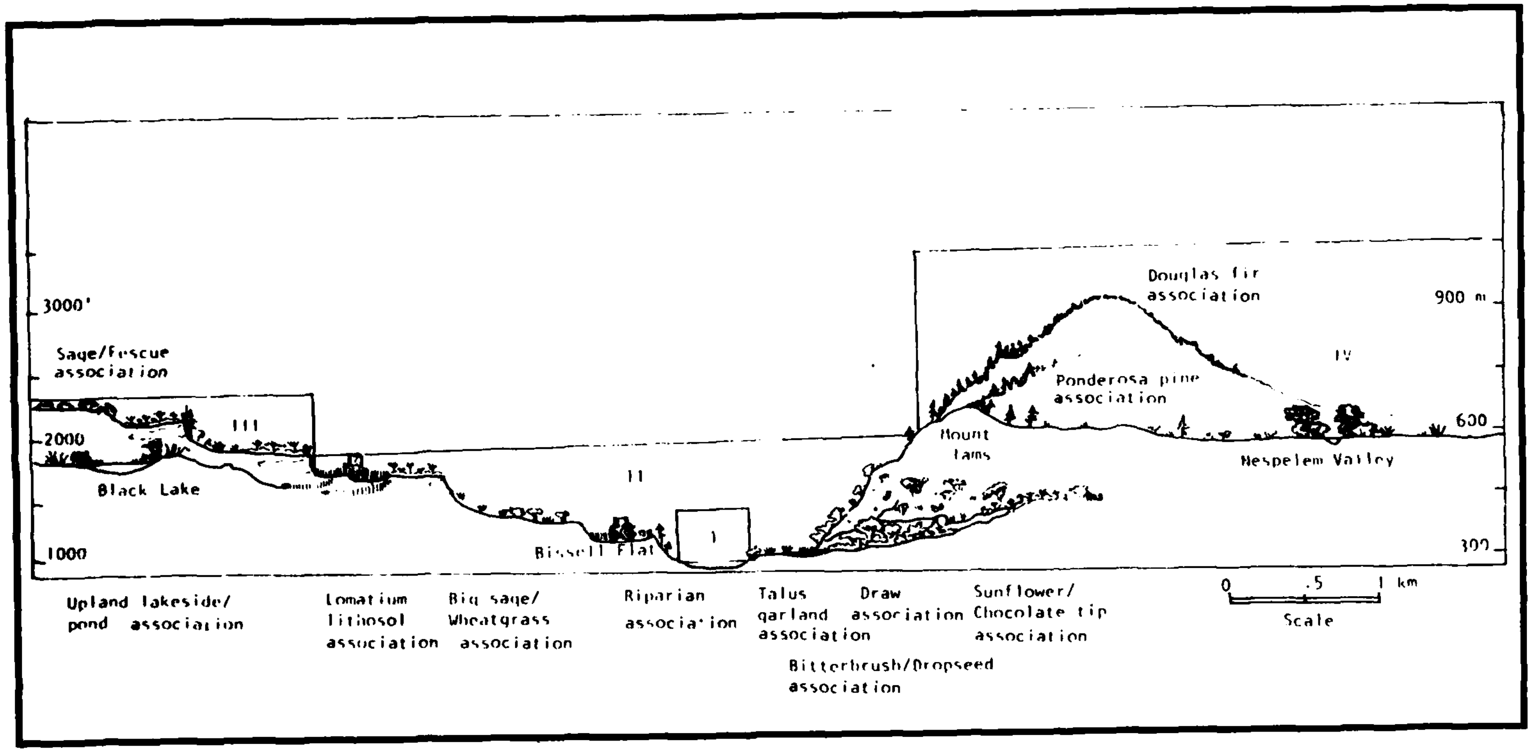

Figure 2.9. Plant associations near the Chief Joseph Dam Project area and associated biophysiographic zones.

currants, hawthorn fruits, and hackberries are found here along with species important for wood (e.g., mockorange, hackberry) and cordage materials. Reeds and other construction materials abound near the lakes in Zones II and III.

Areas with sandy soils support economically important lomatium communities. Today, the former dietary staples of camas, wild onion, and bitterroot still may be found in relative abundance around Rebecca Lake and in stony ground near Goose Lake. Many of the roots and nearly all berries collected by indigenous peoples in historic times are found in Zone II; however, roots grow in greatest abundance in Zone III.

The uplands of Zone IV probably always were more important as hunting rather than gathering areas. Nevertheless, edible black "moss", which is a lichen that grows mainly on larch trees, and several varieties of berries (e.g., foam berries, mountain huckleberries, thimbleberries) occur only in this zone. Wild strawberries and several kinds of mushrooms also were gathered from the moist upland forests historically. In general, these forests were a repository of late-ripening fruits and arborescent raw materials such as bark, nuts, boughs, sap, resin, and cambium.

Fauna

The modern occurrence, relative abundance, habitats, distribution, and behavior of fauna in the project area have been documented in several previous studies (Payne et al. 1975; Bureau of Reclamation 1976; Chaney and Perry 1976; Fielder 1976, 1977; Erickson et al. 1977; Erickson 1980; Chambers 1980). The abundance and seasonality of locally important species are summarized in Table 2.2. We must stress, however, that the composition and distribution of the region's prehistoric animal populations were altered significantly as a consequence of Euro-american influences, which included fur trading, guns, and horses. Several species whose remains commonly are found in archaeological contexts are either severely reduced in abundance or locally extirpated. These include elk, bighorn sheep, pronghorn antelope, bison, and most fur-bearing mammals. Deer are the most notable exception to this trend.

Ethnographic data indicate that artiodactyls were the most commonly hunted mammals, and deer bone is the most frequent mammalian species found in the area's archaeological sites. Although data on the population size and age structures of modern deer herds cannot be applied uncritically to the prehistoric period, certain behavioral characteristics may be long-standing patterns. For example, during the winter (January to March), mule deer form large herds and forage nearer the Columbia River, while during the summer (May through August), they form smaller herds and forage in the uplands away from the river (Erickson et al. 1977).

Among the other mammals, omnivores (wolf, coyote, bear, cougar) in particular, range throughout the project area. Chipmunks, pocket gophers, marmot, cottontails, ground squirrels, and badgers commonly dwell near the river. Because of their abundance and subterranean living habits, we can expect the bones of many of these species, particularly the smaller ones, to occur naturally in archaeological contexts along the floodplain.

A larger group of resident mammals lives away from the river. Most fur-bearers are found in Zones II and IV, although muskrat and beaver occur along the Nespelem River. Other species, such as marten, fisher, ermine, weasel, mink, porcupine, and wolverine, inhabit uplands where trees occur or in the coniferous forest itself.

Although migratory waterfowl, upland game birds, and other birds once occurred in large numbers, the hunting of birds, other than the occasional taking of eagles for feathers, rarely is mentioned in the regional ethnographic literature, and even the ceremonial use of feathers may be a relatively late practice.

Anadromous fish, fresh water molluscs, and reptiles were once abundant and provided major food sources for indigenous peoples. The construction of Chief Joseph and Grand Coulee dams eliminated the resident mussel and turtle populations and destroyed the salmon runs. Nevertheless, the available, limited historical data on fish runs in the pre-dam Columbia River system may be useful in reconstructing the characteristics of fish populations that were once available to earlier residents. For example, Chaney and Perry (1976) estimate that as much as 2,268,000 kilograms (5,000,000 lb) of chinook salmon were taken each year from above the current site of Grand Coulee Dam. Table 2.3 provides data on fish species that once were prevalent in the Columbia River.

Table 2.2
Relative Abundance and Seasonality of Mammal Species in the Project Area, July 1974 - July 1975 (from Erickson et al. 1977:Table 8-2).

Resident Species		Relative	
Common Name	Scientific Name	Abundance[1]	Seasonality[2]
Yellow-bellied marmot	*Marmota flaviventris*	Common	Resident
Least chipmunk	*Eutamias minimus*	Rare	Resident
Yellow pine chipmunk	*Eutamias amoenus*	Rare	Resident
Northen pocket gopher	*Thomomys talpoides*	Common	Resident
Great Basin pocket mouse	*Perognathus parvus*	Abundant	Resident
Western harvest mouse	*Reithrodontomys megalotis*	Rare	Resident
Bushy-tailed wood rat	*Neotoma cinerea*	Common	Resident
Deer mouse	*Peromyscus maniculatus*	Abundant	Resident
Sagebrush meadow mouse	*Lagurus curtatus*	Common	Resident
Muskrat	*Ondatra zibethica*	Rare	Resident
House mouse	*Mus musculus*	Rare	Resident
Montane meadow mouse	*Microtus montanus*	Common	Resident
Beaver	*Castor canadensis*	Rare	Resident
Porcupine	*Erethizon dorsatum*	Common	Resident
White-tailed hare	*Lepus townsendii*	Rare	Resident
Nuttall cottontail	*Sylvilagus nuttallii*	Common	Resident
Shrew	*Sorex* sp.	Rare	Resident
Coyote	*Canis latrans*	Abundant	Resident
Black bear	*Ursus americanus*	Rare	Visitor
Raccoon	*Procyon lotor*	Common	Resident
Wolverine	*Gulo luscus*	Rare	Visitor
Badger	*Taxidea taxus*	Rare	Resident
Striped skunk	*Mephitis mephitis*	Rare	Resident
Bobcat	*Lynx rufus*	Common	Resident
Mule deer	*Odocoileus hemionus*	Abundant	Resident & Local migrant
White-tailed deer	*Odocoileus virginianus*	Rare	Local migrant
Moose	*Alces alces*	Rare	Visitor
Bat	*Myotis* sp.	Common	Resident

[1] Abundance Rating: Abundant = frequently recorded; Common = regularly recorded in low abundance; Rare = infrequent records.
[2] Seasonality: Resident = year-long presence in study area; Local Migrant = seasonal in-migrant; Visitor = occasional occurrence.

Table 2.3
Seasonality and Availability of Columbia River Fish in the Project Area

Common Name	Scientific Name	Run Time	Weight (kg)
Trout	*Salmo* spp.	Resident	---
Sucker	*Catostomus* spp.	Resident	---
Whitefish	*Prosopium williamsoni*	Resident	---
Steelhead	*Salmo gairdneri*	March - July	4
Sturgeon	*Acipenser transmontanus*	August - ?	---
Chinook Salmon	*Oncorhynchus tschawytscha*	L.May - July[a]	11[a,c]
Silver (coho)	*O. kisutch*	L.Aug. - L.Nov.[a]	4.5[c]
Chum (dog)	*O. keta*	L.Aug. - L.Nov.[a]	5[c]
Sockeye	*O. nerka*	June - Sept.	1.5 - 3.5[b]

[a] Ray (1932)
[b] Carl et al. (1977)
[c] Bureau of Reclamation (1976)

3. CULTURAL CONTEXT

The principal ethnographic sources for the project area are Ray's (1932) study of the Sanpoil and Nespelem -- peoples occupying the area north and south of the Columbia River from above the Spokane River west to the Omak Trench -- and Spier's (1938) study of the Sinkaietk, or Southern Okanogan -- the people occupying the area around the Columbia and Okanogan rivers west of the Omak Trench. In addition, numerous regional summaries, ethnohistories, and ethnogeographies provide useful supplementary information (Teit 1930; Spier 1936; Ray 1936, 1939, 1945, 1975; Lee 1967; Chance 1973; Chalfant 1974; Kennedy and Bouchard 1975; Bouchard and Kennedy 1979). Recent ethnobotanical studies of the area include useful information about plants used for food and technological purposes, as well as important data about cultural activities associated with their collection and preparation (Turner 1978, 1979; Turner et al. 1980).

Ethnographic Studies

In 1928, Verne F. Ray began a study of the Salishan peoples of northeast Washington. Originally prepared as a Masters thesis at the University of Washington, this study of the Sanpoil and Nespelem tribes, who lived in and around the project area, has become the single most important ethnographic source for the region. Although contact with Euroamerican culture already had occurred when Ray's informants were still youths, traditional lifeways had not been altered dramatically. Like other groups on the north-central Plateau, the Sanpoil and Nespelem were never party to any formal treaties with the United States. Instead, they remained in their traditional territory and lived according to traditional ways, despite the increasing presence of whites, until 1872. At that time, the United States government set aside a reservation for the area's indigenous groups and began a gradual program of resettlement. Originally, the reservation's boundaries were the Columbia River on the south and east, the international boundary on the north, and the Okanogan River on the west. Only a decade later, the government declared the north half of the reservation to be "public domain" and opened the area for settlement by whites.

Spier's (1938) study of the Sinkaietk (Southern Okanogan) provides the second most important source of information about northern Plateau tribal life. These people practiced lifeways that were quite similar to the Sanpoil and Nespelem, and what follows is a synthetic summary of regional cultural patterns as drawn from Ray, Spier, and others.

Current tribal residents, many of whom are direct descendents of the area's prehistoric inhabitants, occupy the original southern half of the reservation. The ten tribes, first gathered onto the reservation in 1872, officially are known as the Colville Confederated Tribes. The traditional territory of the Sanpoil and Nespelem included most of the east half of the current reservation, and the traditional territory of the Sinkaietk included what is now the west half of the reservation. All spoke dialects of Interior Salish as did most tribal groups surrounding the area.

Although it was difficult even 40 or 50 years ago to disentangle traditional cultural practices from those that had arisen in response to the arrival of Euroamerican settlers, available ethnographic summaries nonetheless are considered to be relatively reliable because northern Plateau tribes tended to remain more isolated and independent than groups whose lands were more favored for white settlement. This cultural conservatism, or traditionalism, is evident even today. Many tribal members still participate in traditional religious practices as well as hunting and gathering activities. Despite being aided by rifles, pick-up trucks, and freezers, these people follow many of the seasonal subsistence patterns of their immediate ancestors, many of which doubtless have direct ties to prehistoric patterns.

The Seasonal Round

Major activities involved in the traditional yearly subsistence - settlement cycle are summarized in Table 3.1 and diagrammatically portrayed in Figure 3.1. The central base of the settlement network was the winter village, which was occupied from mid-October or November until the coming of the spring thaw in February or March. Foods (primarily roots, fish, and meat) and other materials destined for winter use were stored in or around the village. Before the

Table 3.1
Subsistence - Settlement System of the Sanpoil and Nespelem

Season	Site Type	Location	Group	Subsistence Activities/Critical Resources[1]
Feb. - Mar.	Spring Camp	Floodplain	Most of community	Domestic activities. Day-long foraging trips: shellfish, small game, fish, prickly-pear, pine cambium, black tree lichen, early greens. Stored foods.
Mar. - May	Root Camp	Plateau, coulee	Several families	Day-long root digging trips: bitterroot, white camas (biscuit root), other roots. Consolidation and processing of roots. Occasional domestic activities. Base for hunting parties. Base for lithic procurement parties (?).
	Way camp	Plateau, coulee	Men	Hunting: antelope, deer, small game.Primary butchering (?) Quarrying (?): cryptocrystalline rocks (?).
	Way camp	Plateau, coulee	Women	Root digging: bitterroot, white camas, other roots.
May - Aug.	Fish camp	Floodplain	Large groups, mixed communities	Preparation of weirs and channels.Construction of summer dwellings and fish drying racks. Fishing: steelhead, chinook salmon. Day-long foraging trips: serviceberries, other early berries. Domestic activities.
Sept.- Nov.	Fish camp	Floodplain	Small groups	Fishing: silver (coho) and chum (dog) salmon, whitefish, suckers, trout. Day-long foraging trips: seeds, nuts.
	Way camp	Forest	Family groups	Long foraging/hunting trips: berries, nuts, black tree lichen, forest products, tules (?), deer.
	Way camp	Plateau	Family groups	Long foraging/quarrying (?) trips: tules, fall roots, cryptocrystalline rocks (?).
Nov.- Feb.	Winter village	Floodplain	Winter community	Construction and maintenance of winter dwellings. Domestic activities: crafts, tool manufacture and maintenance. Day-long foraging trips: fuel, pine cambium, black tree lichen. Opportunistic hunting: deer/elk.
	Hunt camp	Forest	Men, some women	Trapping: fur-bearing mammals. Hunting: deer/elk. Primary butchering and meat processing.

[1] Activities or resources followed by (?) are hypothetical.

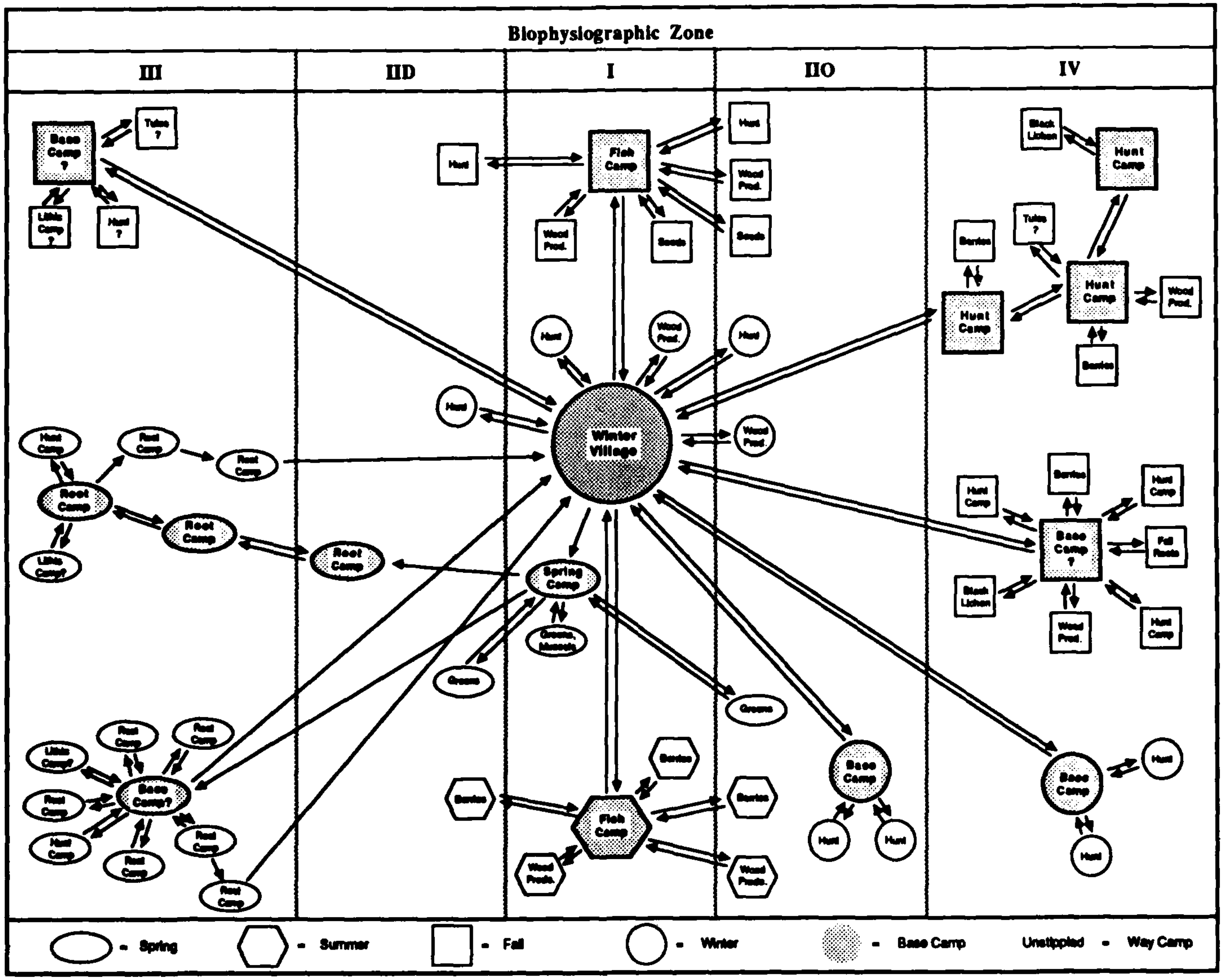

Figure 3.1. Schematic representation of ethnohistoric Sanpoil - Nespelem seasonal round.

protohistoric period, all winter villages consisted of semisubterranean dwellings (Ray 1932:31). During the winter, people participated in a variety of individual and communal activities: hunting, maintaining stores and personal goods, visiting between villages, holding ceremonies, playing music, telling stories, among others. During some winters, short hunting trips along the river were all that was needed to supply enough meat for the entire village. In leaner years, however, groups of men and women went into the Okanogan Highlands in search of game (Ray 1932:28,77-94; Spier 1938:11,19-25). If the hunt lasted several days and yielded a large kill, the party established a base camp in the Highlands and butchered the meat there.

All villages that Ray describes occur along the Columbia River; however, habitation sites have been found elsewhere in the area. For example, at least one housepit village is known to occur in the Omak Trench north of the Goose Lake Substation (Manfred E.W. Jaehnig, personal communication). Nevertheless, areas away from the river generally were used only for hunting and gathering.

After the onset of the spring thaws, families left their housepits and established above-ground camps nearby (Ray 1932:27). During this part of the seasonal cycle, a variety of locally available resources, such as fresh water mussels, fish, early greens, and small game, supplemented whatever remained of the winter stores.

Available data indicate that native peoples had knowledge of approximately 300 species of plants (Ray 1932; Spier 1938; Turner 1978, 1979; Turner et al. 1980), and that fully half of their diet consisted of plant foods (Post 1938:12), which were gathered by women largely during the spring and summer months. Few available plants were neglected; if a plant was not used as food, it found use as a medicine, fuel, tool, or raw material to make mats, textiles, or cordage.

The yearly subsistence round began with the gathering of the first emergent shoots of spring, shifted to intensive collection of roots after April, continued with the harvest of serviceberries in June, and ended with the picking of chokecherries and other fruits in July, August, and September. Serial ripening of major floral foodstuffs allowed the area's residents time to gather, process, and store each crop as well as time for travel between collecting areas. Ethnographic accounts suggest that supplies of plant foods were adequate for subsistence needs in most years and that surpluses were sufficiently common to form a basis for interregional trade (Post 1938:26; Turner et al. 1980:65,116).

Plant collecting began in earnest when spring shoots began to appear on south-facing slopes near the winter villages. Small groups of women, guided by someone with extensive knowledge of past harvests, ranged over select areas with their digging sticks and collecting baskets. A single person might cover as much as a half an acre a day and harvest a bushel of roots (Ray 1932:98). The produce was dried on the spot and transported back to the winter village for storage. "White camas", or biscuit root (lomatium), and bitterroot were gathered in large numbers. Desert parsley, Indian celery, wild onion, and desert lily also were prized; however, they naturally occurred in much less abundance, and this was reflected in the harvest. This early collecting season was accompanied by a "First Fruits Ceremony" to insure a good harvest. Parallel ceremonies subsequently were held for each important plant food as it became available for harvest. During this time, some families who lived on the north side of the river moved south onto the more productive gathering grounds in Zones II and III; others went to fishing areas.

In early May, sturgeon, small suckers, and trout began to appear in the area's rivers and streams, followed soon by steelhead and chinook salmon (Ray 1932:28). As the first fish began to appear, people started to set up temporary fishing camps. The mouth of the Nespelem River is the only place in the project area suitable for a fish trap, but the available spawning area in this stream is quite restricted because a series of falls occurs less than a kilometer upstream from its confluence with the Columbia River. Accordingly, most fishing in the immediate project area probably was accomplished from canoes or by spearing and dip-netting at rapids, where weirs and artificial channels could be constructed to help impede or direct fish runs (Ray 1932:58). Women were in charge of the processing and drying of fish; temporary drying racks were set up at the fishing sites. During this same season, women also were busily engaged in harvesting serviceberries along lower stream courses and in canyon bottoms. Wild currants and sunflower seeds augmented the food cache during midsummer. Chokecherries, which were harvested in August, were either dried whole or made into cakes. Dogwood fruits, Oregon grape, and wild gooseberries were picked in canyons and draws.

Summer fishing continued into August, when runs of chinook salmon ended. This was followed in early September by dispersal of the groups who had come together for fishing (Ray 1932:28). Some people ventured up or downriver in search of the now scarcer salmon, and others went "into the mountains" -- either the Okanogan Highlands or, with the introduction of the horse, possibly into the Cascades -- to hunt and to collect berries, black tree lichen, and autumn roots.

By the end of September, the gathering season was virtually over; the last of the lower-elevation fruits -- blue elderberry and hawthorn -- and the mountainous produce -- pine and hazel nuts -- ripened during this time. Winter villages were reoccupied by about mid-October. All dried foodstuffs were stored and houses were cleaned and repaired (Ray 1932:28); berries, salmon, and various raw materials were stored in underground pits and above-ground holds.

With the first frosts, a final phase of plant collecting took place around the area's marshes and lakes that concentrated on materials important for utilitarian rather than dietary usages. These included fiber-producing plants like nettle and Indian hemp, bulrushes for weaving mats, and a variety of other flexible materials (e.g., bunchgrass).

In most years, the cumulative stores from hunting, gathering, and fishing were adequate to support the village for the winter; game was hunted largely to provide some variety in an otherwise constant diet of dried foodstuffs. In years of short supply, however, hunting became more of a necessity and was augmented by the gathering of cactus pads, rosehips, and black tree lichen to prevent starvation.

The Historic Period

The historic era in the region commences in 1811 with David Thompson's trip down the Columbia River from the Colville River to Astoria for the North West Fur Company. Later that same year, a party representing the Pacific Fur Company established Fort Okanogan at the mouth of the Okanogan River but did not venture farther upriver. During its first season of operation, Alexander Ross, who was the sole person manning the post, took in 1,550 pelts in return for a small amount of trade goods. The second season was less productive. In 1813, the North West Fur Company purchased all of the Pacific Fur Company's holdings and took over operations at Fort Okanogan. As the numbers of pelts coming into the fort continued to fall below profitable levels, the post came to be used primarily as a route junction, repair station, and supply depot. In 1821, the North West Fur Company merged with the Hudson's Bay Company, and the fort once again changed hands; however, its operations largely remained unaltered. In 1848, shortly after the 1846 treaty between the United States and Great Britain that established the international boundary at the 49th parallel, the Hudson's Bay Company abandoned the fort and began to withdraw their operations into Canada.

During this same period, several church groups sent missions to the Columbia Plateau. Although the Methodists largely confined their activities to the south, Francis Parker visited Fort Okanogan in 1836 as part of his larger tour of observation. Two Roman Catholic priests began making the rounds of Hudson's Bay Company posts in 1838, and regular church services were established at Fort Colville in 1844.

During the British-dominated fur trade era, several official and unofficial American expeditions explored the general Columbia River region. Although Bonneville (1833-1834) and Fremont (1843) stayed to the south, the Wilkes Expedition of 1841 managed to pass through the project area. Although these explorations had little immediate impact on indegenous cultures, the geographical data that they generated provided an essential first step in the eventual settlement of the region.

Despite the signing of the 1846 treaty, no rush occurred to settle the area; instead, the westward tide of American settlers had been deflected southward with the discovery of gold in California. In 1855, gold was discovered near Kettle Falls, and both American and Chinese miners followed the rush north from California to the Plateau. Although the closest major mining area was the Okanogan district, the presence of at least five placer mining sites in the project area attests to its involvement in this historic regional pattern (Thomas et al. 1984). The area also was affected by the development of new transportation routes to move supplies from Portland and Walla Walla north to the mining districts; the two ferry crossing complexes recorded in the project area may date to this period (Thomas et al. 1984).

The Colville Reservation was created in 1872 and subsequently diminished to accommodate miners who had argued for prior claims on the land; the north half of the reservation was opened for settlement in 1891, and the south half in 1916. Along the Okanogan River, where many mining claims were being worked, hostilities erupted between Indians, who resented the loss of their land, and miners. Because mining never was a highly productive venture in the project area, hostilities between miners and Indians never were of any moment.

Although the fur trading period lasted nearly four decades, it appears to have had little effect on the native cultures of the Big Bend region. The Southern Okanogan, who initially were anxious to have a post established among them, never showed much interest in trapping. Relationships between the Indians and the whites at Fort Okanogan always were relatively friendly; Indians frequently camped outside the stockade walls, but the volume of trade between the two cultures was slight. Although the Indians gained a few new items of material culture, no evidence exists to suggest a shift to a cash economy or the adoption of new food resources. Similarly, because trappers and traders received most of their food supplies directly from the post, they did not have to avail themselves of local flora or fauna to the extent that it would have constituted a threat to the Indians. The effects on more distant native groups (e.g., the Sanpoil and Nespelem) would have been even less marked. None of the activities involved in the fur trade were directed towards this reach of the river; transportation routes tended to skirt the Big Bend region as much as possible to save time. Consequently, much of what Ray recorded in the late 1920s and early 1930s as the Sanpoil and Nespelem cultural patterns is likely to have considerable interpretive value for studies of regional prehistory.

4. Regional Archaeological History

Previous archaeological studies on the Columbia Plateau are important for developing project area chronologies, interpretive frameworks, and classification schemes. These investigations, nearly all of which were undertaken in conjunction with the construction of hydroelectric dams along the main stem of the Columbia and Snake rivers, are relatively recent when compared to similar work in other part of the country; indeed, most archaeological reports specific to the region were written within the last 25 years. Before then, Plateau prehistory was described only in the broadest of terms as a part of general regional hypotheses about population migrations and cultural habits. Nevertheless, we will refer to these pioneering synthetic efforts in the course of summarizing those investigations that bear most directly upon the project area.

Several relatively recent investigations are particularly influential in establishing an interpretive framework for the current project. Between 1958 and 1977, a variety of resource inventory, testing, and full-scale excavation projects were conducted at Kettle Falls and along Lake Roosevelt, at Wells Reservoir, at Sunset Creek near Vantage, and along the lower Snake River (Figure 4.1). The discussion that follows emphasizes the contributions of these projects to current understanding of Plateau prehistory.

Fraser River

In the late 1960s, David Sanger summarized a series of archaeological investigations that had been completed during the previous 15 years in southern British Columbia along the Fraser and Thompson rivers (Sanger 1967). Using excavated assemblages from about 20 occupational components, Sanger (1963, 1966, 1968a, 1968b, 1969, 1970) proposed a rough tripartite cultural chronology consisting of Early (four components dated from 7,600 to 5,000 years ago), Middle (five components from 5,000 to 2,000 years ago), and Late (11 components from within 2,000 years ago) periods. Five of these components were radiocarbon aged (uncorrected) by 12 separate determinations. Two sites excavated by Borden near the mouth of the Fraser Canyon provided comparative data. A projectile point typology/ chronology was not developed.

Early Period assemblages include a microblade/ microcore technology that is not associated with housepit sites. Projectile points typically are large lanceolate forms (both triangular and leaf-shaped); however, some side and basal-notched forms occur as well. These styles tend to resemble those of the northern Plains more than contemporaneous Plateau styles (Plano versus Windust/Cascade), although Cascade-like assemblages are present. The toolkit includes both antler wedges and rodent incisor woodworking implements. Fish remains, which are presumed to be salmonid, occur at the Milliken site (8,000 - 9,000 B.P.) and at another component dated at 7,600 B.P. No residential structures are known from this period.

The Middle Period sees a continuation of the earlier microblade/microcore tradition, particularly between 5,000 and 3,500 B.P. Although this technology again appears not to be associated with formal dwellings, site samples are small and excavations easily may have failed to reveal buried houses. Projectile points largely include expanding-stem and lanceolate forms with indented and notched bases that again more closely resemble northern Plains styles (Hanna-Duncan-McKean-Pelican Lake) than those of the southern Columbia Plateau, especially during the earlier part of the period. Later Middle Period (post 3,500 B.P.) basal-notched and corner-notched forms bear much stronger resemblances to styles known to the south. Later assemblages also have a woodworking kit consisting of wedges, nephrite adzes, beaver incisor chisels, and pecked mauls. Fish remains occur throughout the period. Two-meter-deep semisubterranean houses appear during the latter half of the Middle Period.

Late Period assemblages have no microblade technology. Small side-notched projectile points (presumably arrow points) are typical of this time, and the woodworking kit of the Middle Period continues to occur. Fish remains continue to be a prominent component of the faunal assemblage, and housepits are both shallower and more circular.

Although many of Sanger's interpretations have been overshadowed by data from large-scale

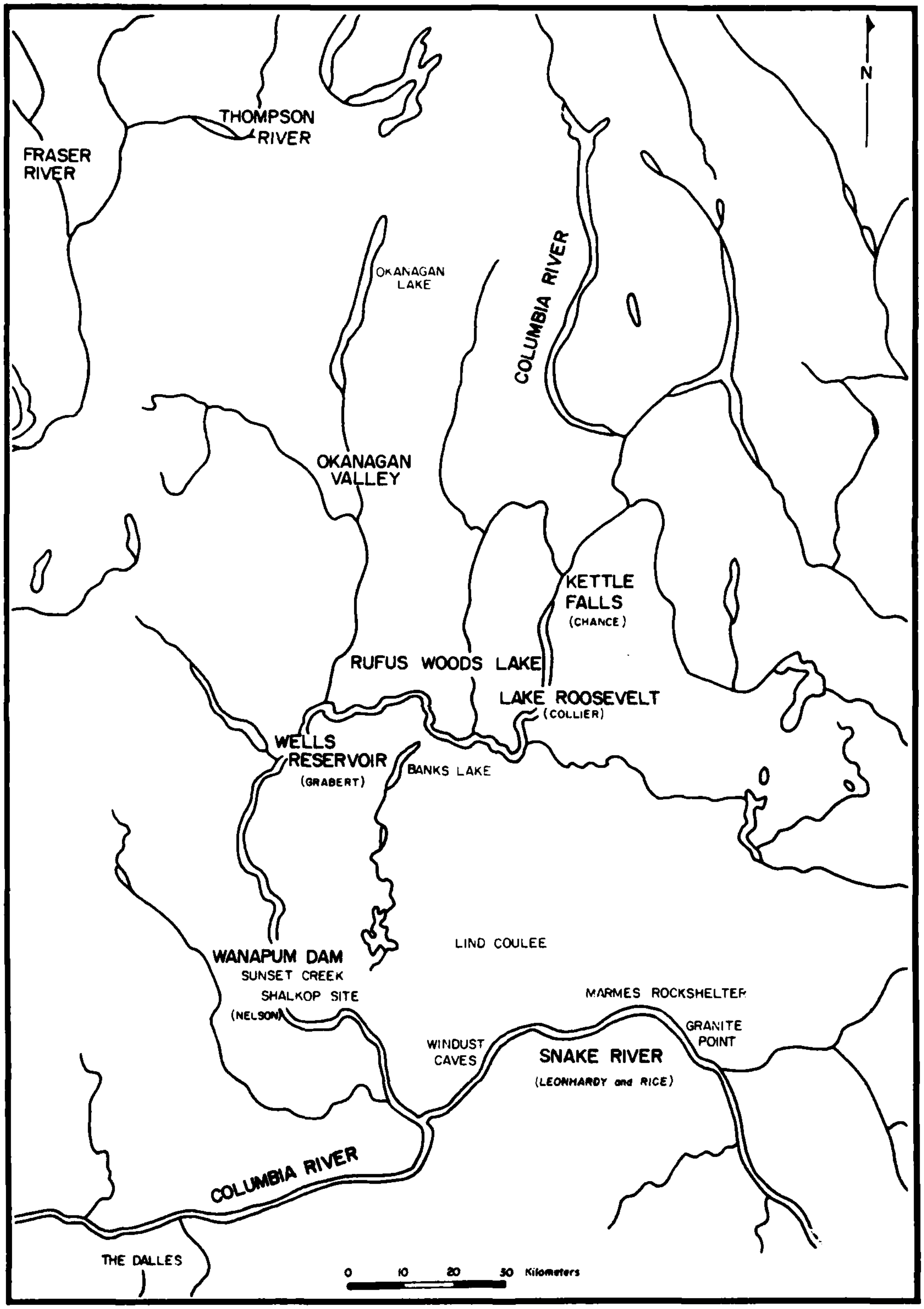

Figure 4.1. Map of the Columbia Plateau showing locations of major archaeological projects.

cultural resources projects that have been completed since the mid-1960s, certain of his observations continue to be important to an understanding of regional prehistory. These include

- The decline of the microblade technology by about 2,500 B.P.;

- The apparent northern/eastern (Plains) cultural affinities of the Fraser River region until the later Middle Period; and

- The "northwesternization" of the Fraser River region during the last 2,000 years.

Arrow Lakes

Turnbull (1971) summarizes the results of a series of salvage excavations completed at five of approximately 80 recorded sites in the Arrow Lakes region of the Columbia River in southern British Columbia. Situated approximately 250 kilometers north and east of the Chief Joseph Dam Project along the Columbia, Slocan, and Kootenay rivers, his investigations disclosed several cultural occupations corresponding in age to Sanger's late Middle Period (about 3,300 - 2,300 B.P.) that are bracketed by five radiocarbon age determinations (uncorrected). These "Deer Park phase" assemblages contain stemmed, corner-notched, and leaf-shaped projectile points resembling styles from both northwest Montana and the Columbia Plateau. A woodworking assemblage that includes nephrite adzes occurs along with a flaked stone tool industry centered on use of tabular quartzite schist. Circuloid, semisubterranean houses and what appear to be mat lodges are known. No data are provided regarding the numbers or kinds of fauna.

A later Plateau phase that is attributed to the period 2,000 to 500 B.P., based on radiocarbon dates, is known from one site. Projectile points include small side and corner-notched forms, but no information is given about house forms or the nature of faunal exploitation.

Upper Columbia Project

One major archaeological project was completed near the project area in conjunction with the construction of Grand Coulee Dam. Carried out in 1939 and 1940, this study resulted in the inventory of the entire length of the Columbia from Grand Coulee Dam to the Canadian border, including the lower reaches of the Spokane and Kettle rivers (Collier et al. 1942). Although work was done in haste because the waters of what was to become Lake Roosevelt were rising behind the dam, researchers did manage to identify a large number of sites, 35 of which they subsequently test excavated. Today, nearly all these sites are inundated.

Project archaeologists recognized three types of sites, which they termed habitation sites, shell middens, and cemetaries. They reported that "about half of all artifacts (of stone, bone, and shell) recovered, and nearly all the more elaborate artifacts, were associated with burials" (Collier et al. 1942:14). Although their efforts failed to produce evidence for differentiating house types, the authors nonetheless concluded that the area was culturally homogeneous and that no significant cultural changes had occurred through time (Collier et al. 1942:10). Indeed, their only major chronological distinction involved artifacts of Euroamerican origin.

Collier and team believed that the prehistoric inhabitants of the upper Columbia region shared cultural traits largely with the Thompson and Fraser river regions; however, at that time few other studies existed with which to make such comparisons. Similarities were noted in artifact types, materials, and specific forms. The authors point out striking similarities in certain bone implements (esp., harpoon points; Collier et al. 1942:Plate IX), a class of quartzite scrapers (Collier et al. 1942:Plate VI), and tubular pipe forms (Collier et al. 1942:Plate XIV). The "northward affiliation" was further confirmed when certain obvious contrasts with sites along the lower Columbia River became apparent. For example, the north-central assemblages had no elaborate bone or stone carvings like those recovered at Wahiuke (near Yakima) and in the Dalles-Deschutes region (cf., Smith 1910; Krieger 1928; Strong 1930). In addition, the characteristic circle-and-dot design, usually found incised on bone or in rock art along the upper Columbia and Fraser drainages, is found only sporadically or not at all along the lower Columbia (Collier et al. 1942:12).

Collier and his colleagues believed that Plateau culture on the upper Columbia was only marginally influenced by Plains or Northwest Coast groups. They also hypothesized that the area had been sparsely populated and that the indigeneous culture was relatively simple when compared with prehistoric population levels and cultural developments along the lower Columbia River, particularly in the Dalles-Deschutes

region. In support of their population level contentions, they cited ethnographic data compiled by Kroeber (1939).

Data recovery strategies and tactics for the Upper Columbia Project were considerably different than those used in modern archaeological investigations. Current research typically requires the collection of as much data as possible and extensive recording of artifacts and features. By comparison, contract specifications for the Upper Columbia Project focused largely on the recovery of burials. When large cemeteries were identified, work was contracted out to commercial undertakers. Archaeological field teams paid little heed to bone artifacts, nor did they sample botanical remains or collect lithic cores, flakes, or other manufacturing detritus. Instead, the primary focus of fieldwork was the recovery of perfectly formed projectile points and other formed tools.

Collier et al. (1942) believed that the oldest materials in their sample dated to no more than 2,000 B.P. With the advent of radiocarbon dating and interregional stylistic comparisons, we now know that some of these materials may be as much as 9,000 year old (Chance and Chance 1982). Disregarding their lack of temporal sophistication, the Upper Columbia collections appear to be remarkably similar in terms of both age and morphology to those we have recovered from the Chief Joseph Dam Project area. This suggests that the prehistoric inhabitants of both areas may have participated in the same cultural system and traditions.

Kettle Falls Project

During the past two decades,. several professional archaeological investigations have have conducted in the Lake Roosevelt region, particularly around the Kettle Falls area (Chance 1967, 1970, 1972; Chance and Chance 1977, 1979). These studies take the stance that the most durable of archaeological remains, namely lithic assemblages, are not the most sensitive to cultural change or the most representative components of a cultural site. Instead, they represent a small and "relatively unelaborated segment of the material culture inventory" (Chance et al. 1977:150). Chance's strong emphasis on cultural reconstruction is indicative of his admittedly historical bia, a point of view that is attributable in part to the unusually rich amounts of ethnohistorical availabe to him. For nearly 15 years, he and his coworkers have intermittently examined sites at the major fishery that formerly occurred at Kettle Falls. Unlike other areas of the Plateau, the fishery was documented by numerous photographs and paintings during the nineteenth century. These sources and others provide details of protohistoric life that are not available for most areas, and Chance has used these materials as the framework within which to interpret his archaeological findings.

In 1971 and 1972, field teams recovered evidence of a long sequence of prehistoric occupations at sites near Kettle Falls as well as abundant associated artifacts and definitive stratigraphy. Based on the results on these and other investigations, Chance proposes a regional chronology that includes five major temporal divisions (Figure 4.2): Shonitkwu (9,000 - 6,000 B.P.), Ksunku (4,000 - 3,200 B.P.), Takumakst (2,800 - 1,700 B.P.), Sinaikst (1,700 - 600 B.P.), and Shwayip (600 B.P. to Euroamerican contact).

Chance hypothesizes that the Shonitkwu occupation at Kettle Falls was relatively large. The peoples possessed a microblade industry and fished for salmonids, probably with weighted nets and other gear. Their diet was likely supplemented by wild fowl, bear and other large mammals, and a species of turtle now believed to be extinct.

The density of cultural remains appearing near the end of the succeeding Ksunku Period indicates a dramatic increase in the intensity of human activity near Kettle Falls. Small tools predominantly are of black argillite, and obsidian (a non-local material) appears in the deposits. The lithic assemblage is largely utilitarian. Salmon, large mammals, and turtles continue to be eaten in abundance, and wild hyacinth bulbs (*Brodiaea*) are characteristic. At the Ksunku site (45-FE-45), medium size shallowly side-notched projectile points, stemmed points, and medium size "hawk-tail" side-notched points appear in the assemblage. These suggest either northern cultural affiliations or in situ local development. Late barbed points, typical of the middle Columbia River area, are scarce at Kettle Falls and only begin to appear around 2,000 B.P.

The Takumakst Period is recognized on the basis of comparative stratigraphic data from excavations at four fisheries sites. Chance currently suspects that a pre-Takumakst Period occurs at approximately 3,000 B.P. and lasts until 2,600 B.P. or later. Occupations attributable to this 'pre-period' indicate decreased population densities along the river margins in

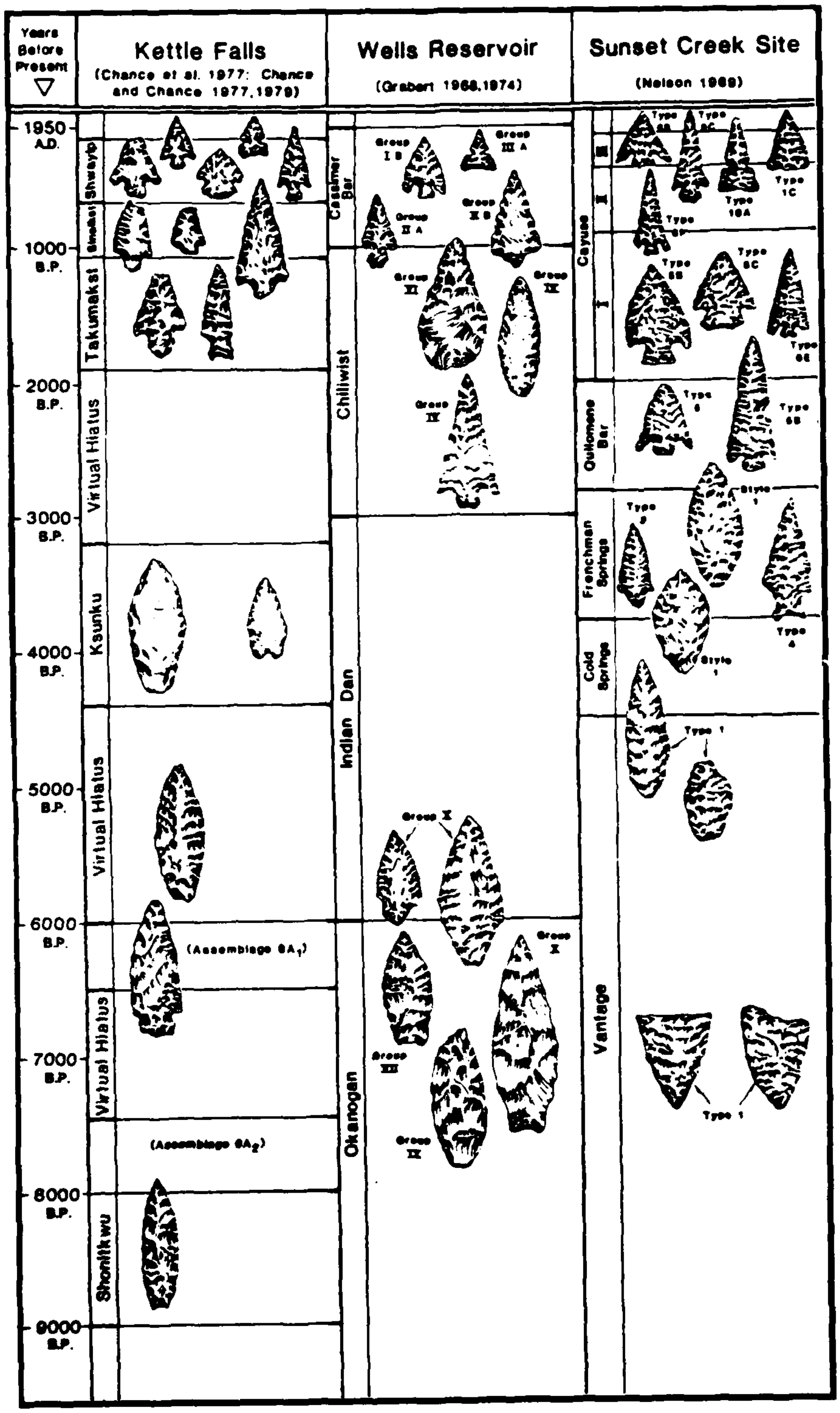

Figure 4.2. Selected Columbia Plateau cultural chronologies.

the Kettle Falls area. Assemblages contain relatively high frequencies of cryptocrystalline artifacts, a few cobble cutting tools, and contracting and square-stemmed projectile points. The Takumakst period itself is characterized by a relatively rough quartzite-based lithic technology. The most characteristic tool form from this period is the small, chunky "Takumakst chopper". Interestingly, Takumakst sites appear to contain specialized assemblages even though they display the lowest degree of skill in lithic technology of any period.

The Sinaikst Period includes assemblages that are the most stylistically diverse and the least uniform of all periods in the region. Projectile point styles vary widely and their developmental sequence is not at all clear. During this period, Chance hypothesizes that trade with groups from outside the region became a significant economic factor, and he cites the increased frequency of exotic lithic material in the assemblages as evidence for such trade. Likewise, the proliferation of point styles suggests to Chance that several contemporary cultural traditions (or groups) coexisted at the fishery. Deep pit houses occur on Hayes Island during this period.

Population density appears to decline during the succeeding Shwayip Period. This period also provides the first evidence of economic stratification, a pattern that may have continued into the nineteenth century and that possibly was based on access to the best fishing places. The characteristic tool of the period is an implement that Chance terms a "miniature quartzite knife".

Chance's studies provide the best source of ethnographic data allied with archaeological remains of any project in the northern Plateau, and the time depth of the archaeological record at Kettle Falls coincides closely with that of the Chief Joseph Dam Project area. Unfortunately, Chance's caution in the possible use of lithic artifacts as indicators of cultural change causes him largely to forego the categorization of such remains within any kind of definitive, replicable system. Consequently, despite the utility of his chronological distinctions for general comparative purposes, his system is typologically rudimentary. Because other regional assemblages typically are organized according to projectile point classifi-cations, it is difficult to make comparisons to the Kettle Falls materials. Nonetheless, the data from this area can be of considerable use to current and future researchers.

Wells Hydroelectric Project

Another relatively recent series of investigations undertaken near the project area is Garland F. Grabert's work immediately downriver from Chief Joseph Dam. During the 1960s, Grabert directed resource inventory and salvage efforts associated with the construction of the Wells Hydroelectric Project, which inundated portions of the lower Okanogan River valley and adjacent areas along the Columbia River (Grabert 1968). He later extended his research northward to include the watershed between the Thompson and Okanogan rivers in south-central British Columbia (Grabert 1970).

Grabert's perspective is strongly prehistoric. He is particularly interested in determining how settlement and subsistence patterns were influenced by glacial retreat and hypothesizes that slower drying and warming trends in the northern Plateau may have prolonged reliance on more mobile hunting and gathering patterns and supressed adoption of the fishing-oriented economy that is characteristic of classic Plateau cultures. Grabert also treats his assemblages as part of a macroregional paleowestern cultural tradition. For example, the occurrence of a microblade industry and certain woodworking techniques are cited as shared circumboreal traits. Nevertheless, Grabert's primary goal was to establish a regional chronology for the Okanogan Valley and to correlate this construct with previously established cultural sequences for the southern Plateau and middle Fraser regions.

Grabert carried out his most intense studies at sites in the Wells Reservoir region, and these efforts provide the basis for both his projectile point classification system and his cultural period assignments. Although his subsequent work to the north of Wells often depended upon the willingness of private landholders to allow archaeological investigations on their property, he was often able to collect diagnostic artifacts that were useful for comparisons with his more abundant southerly data.

Grabert's work to the north confirmed his findings in the lower Okanogan Valley that most sites are less than two or three thousand years in age and that no formal house structures occur that are more than 3,000 years in age. The dwellings he found appeared to be uniform throughout his area of interest: all are semi-subterranean structures. Differences occur, however, in community siting and layout. Houses in British Columbia tend to be situated in sheltered areas,

while those to the south are more often found on the floodplain. Large villages were more common along the middle and southern reaches of the Okanogan River; however, they occur to the north as well.

Chronological sequences established for Wells Reservoir hold for the northern region. Projectile point styles are similar, although side-notched, triangular forms are more numerous in the north and small, stemmed and corner-notched predominate in the south (Grabert 1970:230).

In comparing the Okanogan Valley to other regions of the Plateau, Grabert felt that the upper reaches of his study area probably manifest the most conservative way of life. For example, in the upper Okanogan and Thompson river regions, large, deep semisubterranean houses persist well into the nineteenth century, whereas in the southern Okanogan and adjacent regions, this house form likely is discontinued by the first quarter of the nineteenth century. Likewise, use of shellfish is much more common south of the international boundary; however, this may be attributable simply to environmental differences between the upper and lower reaches of the Okanogan.

Based on his work at six sites in the Wells Reservoir area and a like number of sites to the north, Grabert divides the prehistoric temporal continuum into four cultural periods: Okanogan (? - ca. 6,000 B. P.), Indian Dan (ca. 6,000 - 3,000 B.P.), Chiliwist (ca. 3,000 - 900 B.P.), and Cassimer Bar (ca. 900 - 150 B.P.).

Several distinguishing features are shared by the Okanogan and Indian Dan phases; however, earlier (Okanogan) assemblages are characterized by large ridge-backed scrapers or knives, abundant large flake tools, large leaf-shaped points, and a few stemmed points. Basalt is the most common raw material used in the production of stone tools in the Okanogan phase.

During the Indian Dan phase, large basal-notched and stemmed projectile points appear in the assemblages along with smaller lozenge and leaf-shaped points. Milling stones also may occur; however, no hand milling stones are known, and no unequivocally identified pestles occur. Stone adzes make their appearance during this phase, and bone tools are relatively common. Fish remains are abundant in some components, as are deer, elk, mountain sheep, and mountain goat. Evidence of interregional trade occurs for the first time during this phase.

The most recent phase, Cassimer Bar, is characterized by shallow, saucer-shaped and rectangular house structures and small corner-removed, corner-notched, and side-notched projectile points. In addition, a stone basket mortar base, zoomorphic stone carvings, and steatite carvings are associated with materials of this period. Geometric designs are found on both bone and stone objects, and composite bone harpoons occur in the assemblage. Cassimer Bar phase settlements tend to be fairly large, and the presence of abundant fish and shellfish remains attest to the importance of these resources in the diet (Grabert 1970:Table 10).

Grabert's cultural chronology largely is based upon the occurrence of specific styles of diagnositc tools, particularly projectile points. Specific temporal assignments are supported in several instances by radiocarbon assays of associated organic materials. Despite the importance of volcanic ash as a temporal stratigraphic marker, Grabert did not undertake any analyses that could yield identifications of the specific sources or associated dates for the tephra.

Sunset Creek

Nelson's (1969) work at the Sunset Creek site (45-KI-28) near Vantage, Washington is nearly contemporaneous with Grabert's work in the Okanogan Highlands. Although the report issuing from this research largely is confined to a single site, his carefully drawn conclusions and detailed artifact descriptions establish the document as the baseline against which all other Plateau reports must evaluate their chronological distinctions. Nevertheless, Nelson only reports on a limited subset of his available physical remains; both features and botanical materials are excluded from consideration.

Based on his analyses, Nelson proposes a regional cultural chronology (uncorrected) consisting of five phases (Figure 4.2): Vantage (? - 4,500 B.P.), Cold Springs (4,500 - 3,700 B.P.), Frenchman Springs (3,700 - 2,800 B.P.), Quilomene Bar (2,800 - 2,100 B.P.), and Cayuse (2,100 - 150 B.P.). Nearly all identifying distinctions for these phases are based upon changes in projectile point styles. More specifically, the differences in these phases may be summarized as follows:

- During the Vantage phase, projectile points are quite large and lanceolate in

overall form; occasionally they are modified by shouldering.

- During the Cold Springs and Frenchman Springs phases, leaf-shaped points decline in popularity. This period also is characterized by a general reduction in point size, finer flaking technique, and greater variety in blade shapes.

- Leaf-shaped points are rare throughout the Quilomene Bar and Cayuse phases; where they do occur, they probably represent items of trade or aberrant forms.

- Both notched and unnotched triangular points first occur during the Cold Springs phase, during which time a dramatic shift occurs from leaf-shaped to triangular point forms. This stylistic change is complete by the beginning of the Quilomene Bar phase. Thereafter, virtually all projectile points are based on a triangular outline, and even notched points are manufactured from triangular blanks (Nelson 1969:102).

To assist in the attribution of general cultural features allied with his phases, Nelson makes use of Daugherty's (1962) concept of an Intermontane Western Tradition. This construct postulates the existence of general developmental ties between the Southwest, Great Basin, and Plateau, and specifies a series of periods having observable referents in the prehistory of each region. Because of the importance of Daugherty's model to this and other developmental hypotheses for the Columbia Plateau, it is useful to review its general features.

During what Daugherty terms his Early Period (11,000 - 8,000 B.P.), all regions are characterized by diverse hunting and gathering economies. Although intense, specialized use of locally available plant or animal resources is expected, Daugherty suggests that this was not the case because local subsistence - settlement traditions had not yet developed; however, unequivocal archaeological data for this period is scarce.

During the Transitional Period (8,000 - 4,500 B.P.), Plateau cultures began to concentrate along available waterways and become increasingly reliant on freshwater mussels and salmon.

The ensuing Developmental Period (4,500 - 2,000 B.P.) witnesses an increase in regional specialization that eventually culminates in ethnographically documented cultural patterns. During this time, the Northwest developed more elaborate and efficient fishing techniques, while the Southwest refined a specialized agricultural economy.

The Late Period (2,000 B.P. - historic contact) witnesses fully developed area traditions. Near the end of the period, Plains tribes begin to exert important influences upon indigenous Plateau groups.

Based upon this model, Nelson proposes a series of seven cultural periods that embrace the entire temporal span of human occupation on the Columbia Plateau. Period I (11,000 - 9,000 B.P.) is characterized by the occurrence of stemmed lanceolate projectile points and at the time the Sunset Creek report was prepared was represented at only four well-known sites: Lind Coulee (Daugherty 1956; Monseth et al. 1973; Irwin and Moody 1976, 1977, 1978), 35-WS-4 (Cressman et al. 1960), Windust Cave (Daugherty 1962; H. Rice 1965; D. Rice 1972), and Marmes Rockshelter (Fryxell and Keel 1969; D. Rice 1969, 1972; Gustafson 1972). Although the subsistence economy is presumed to be based on hunting and gathering, the lack of uniformity among faunal assemblages from these sites makes it difficult to establish specific adaptations.

Period II (8,000 - 6,500 B.P.) is associated with an hypothesized general drying of the region that served to reduce big game populations. Gustafson (1972) argues, however, that although populations of certain species may have declined during this period, others increased, and the total amount of available game remained relatively unchanged. In an earlier report, Cressman et al. (1960) conclude that fishing at The Dalles diminished during this time. If such changes in available food supplies are indeed characteristic of this period, we might expect to see evidence of formation of highly generalized subsistence patterns in which gathering of plant foods and hunting of small game were emphasized. This period is manifest at Sunset Creek by the Vantage phase assemblages, and influences from beyond the Columbia Plateau are not evident in tool assemblages.

Period III (6,500 - 4,500 B.P.) is represented at Sunset Creek by Cold Springs phase materials. This period sees the introduction of a developed

food grinding tool complex into the Plateau and is characterized by a major shift from hunting to gathering. The associated appearance of notched points and manos suggests to Nelson that this subsistence pattern reorientation may have come from the Great Basin. This contention is further supported by the appearance of large quantities of obsidian, a non-local material that is readily available in the northern Great Basin.

Period IV (4,500 - 2,000 B.P.) is manifest by little economic change and a continuance of trade with the Great Basin. Despite the endurance of generalized cultural patterns established in Periods I and II, regional differentiation becomes more distinct as one moves forward in time. This is particularly evident in styles of projectile points and cobble implements from the middle Columbia, lower Snake, and upper Columbia (Nelson 1969:105). This period also exhibits the first definitive evidence of inland group ties to coastal peoples. Although such connections are not believed to be particularly strong, a few trade items occur from Rabbit Island I and some duplication of projectile point styles is noted (Nelson 1969:Appendix A, Stemmed Projectile Points, Types 3 and 5).

Period V, which Nelson terms "Coastal Ties," begins approximately 2,000 years ago. Although other researchers have suggested that this period (early Cayuse phase) marks the migration of Salishan speakers into the Plateau, Nelson neither supports nor rejects this contention. He does agree, however, that strong ties exist with coastal peoples. Dentalia, shell pendants, mussel shell adzes, ground stone adzes, and other coastal implements occur in some abundance, and evidence exists to suggest even sharing of art motifs between the two regions (Nelson 1969:105). Most definitive, however, is the appearance in the Plateau of several types of fishing implements known from much earlier cultural contexts on the coast. Prominent among these are three-pronged salmon spears and composite harpoon toggles, which occur along the British Columbia and Washington coasts by 3,000 B.P. This suggests to Nelson that the marked riverine adaptations that characterize Plateau ethnographies may represent coastal traits that were introduced into the Plateau near the beginning of Period V. Nevertheless, local artifact styles also occur during this period, and, although trade with the Great Basin continues, it appears to wane, particularly to the north. This observation accords well with both Ray's and Grabert's conviction that northern Plateau peoples were more independent and conservative than those to the south.

Period VI (350 - 190 B.P.) is characterized by the protohistoric movements of local Plateau populations. Corresponding to a subphase of the Cayuse phase, this period represents the indirect effects of the expanding American frontier. Frequent, regular trade occurs between the Plateau and the Northwest Coast, Great Basin, and Plains. Not surprisingly, this results in considerable diffusion of stylistic elements among the regions. An efflorescence of material culture occurs, along with a tendency towards homogeneity in artifact assemblages.

Period VII (190 B.P. - present) represents expanded contact between Plateau peoples and the American frontier. Cultural efflorescence continues briefly, then withers rapidly.

Nelson stresses that his developmental sequence emphasizes the processes of diffusion, acculturation, and migration rather than independent internal development. Nelson also cautions that many of his hypothesized trends may reflect differences in available sample sizes from one period to the next. For example, observed differences in patterns may be more distinct during the later part of the cultural sequence simply because we have more material from which to draw our conclusions (Nelson 1969:104-108). Although his undoubtedly is too simplistic a model to accurately describe the evolution of Plateau culture, it nonetheless provides considerable food for thought and is one of the more well-developed interpretive frameworks in the regional literature. In addition, the sheer numbers of artifacts included in his sample and the care he takes to describe his collections make his work of considerable interest and value to researchers interested in making detailed interregional comparisons.

Lower Snake River

In 1970, Frank C. Leonhardy and David G. Rice proposed a cultural typology for the lower Snake River region, that area along the Snake River between its confluences with the Columbia and Clearwater rivers. The authors propose a system of six cultural phases for chronologically ordering archaeological manifestations in the region (uncorrected): Windust (10,000 - 9,000 B.P.), Cascade (8,000 - 5,000 B.P.), Tucannon (5,000 - 2,500 B.P.), Harder (2,500 - 700 B.P.),

Piqúnin (700 - 300 B.P.), and the ethnographic Numípu (300 - 100 B.P.). This construct, which has been of particular value to subsequent researchers thoughout the Columbia Plateau, is based primarily on assemblages from Marmes Rockshelter (D. Rice 1969) and the Granite Point locality (Leonhardy 1970a).

The Windust phase, which is identified on the basis of artifacts from Windust Caves (H. Rice 1965), Marmes Rockshelter (D. Rice 1969), and Granite Point Locality I (Leonhardy 1970a), is characterized by a distinctive set of projectile point forms that have relatively short blades, shoulders of varying prominence, largely straight or contracting stems, and straight to slightly concave bases (Leonhardy and Rice 1970: Figure 2). Lanceolate points occur in Windust assemblages but are rare. Knives consist of relatively crude, large lanceolate or ovate forms. Utilized flakes are the most numerous and varied artifacts in the assemblage, but artifacts made of bone are uncommmon. Lithic technology apparently was quite well-developed; tools mostly were fashioned of cryptocrystalline silicates, although fine-grained basalt was used in small amounts.

Insofar as the Windust subsistence system is concerned, sites of this period are known to contain the remains of elk, deer, pronghorn antelope, rabbit, beaver, and river mussel. To date, no artifacts indicative of plant food processing (e.g., mortars, manos, metates, pestles) are known from Windust phase contexts.

The Cascade phase is defined on the basis of occupational components at ten separate sites. It is subdivided into two subphases on the basis of a single style marker, the Cold Springs side-notched projectile point (Butler 1961); only the latest subphase exhibits this distinguishing trait. Otherwise, Cascade assemblages essentially are identical to one another. Large, generally well-made lanceolate and triangular knives characteristically occur, as do tabular and keeled end scrapers. Cobble implements include pounding and grinding stones as well as edge-ground cobbles, a hallmark of Cascade phase sites. Bone implements are more common than during the Windust phase. Although crypto-crystalline silicates are prominent during the early part of the phase, increasing reliance is placed on fine-grained basalts as time goes on.

Elk, deer, and pronghorn antelope continue to be exploited as food. In addition, two species of river mussels (*Gonidea angulata* and *Margaritifera falcata*) are common, as are various large salmonids. Although hunting patterns appear to be much like those in the Windust phase, increasing reliance on fish indicates that the subsistence system may have been undergoing significant change. Manos appear for the first time during this period.

The Tucannon phase is quite distinct from the Cascade phase; in fact, Leonhardy and Rice (1970) do not consider them historically related. Unfortunately, a gap exists in the archaeological record at about 5,000 B.P. -- the proposed time line between the Cascade and Tucannon phases -- that prevents any more definitive statements to be made regarding the historical relationships, or lack of them, between the two phases.

Two types of projectile points are prominent in Tucannon assemblages. The first has a short blade, contracting stem, and shoulders of varying prominence. The second is notched low on the sides or at the corners to produce an expanding stem and short barbs (Leonhardy and Rice 1970: Figure 7). Various scrapers and pounding stones occur along with hopper mortar bases, pestles, and sinkers. Well-formed knives are virtually absent. The bone and antler tool assembage includes wedges, awls, and bone shuttles, perhaps indicative of net-making (Leonhardy and Rice 1970:11). Basalt predominates in the lithic assemblage, but the stone tool manufacturing technology appears somewhat crude.

Tucannon phase faunal assemblages are virtually the same as the Cascade; however, increased quantities of mussel indicate that shellfish was becoming increasingly important in the diet.

The Harder phase is defined on the basis of five sites. Two subphases are distinguished largely on the basis of settlement types and stratigraphy. During the early subphase, all occupation components appear to be camps; during the later subphase, substantial pithouse villages appear. The early subphase is characterized by large, basal-notched projectile points and by a corner-notched variety that is called "Snake River Corner-notched" (Leonhardy and Rice 1970: Figure 9). During the later subphase, these forms are relatively rare and are replaced by small, finely-made corner and basal-notched forms associated with the Snake River Corner-notched type. Several types of scrapers with distinctive shoulders appear in both subphases, and lanceolate and pentagonal knives also are characteristic of both. A variety of cobble implements (e.g., sinkers, utilized spalls,

pestles, hopper mortar bases) and bone tools (e.g., awls, needles, beads, gaming pieces) are common.

Bison (*Bison bison*) and mountain sheep appear among the economic fauna; deer, elk, and antelope persist from earlier periods. Remains of smaller mammals, including dog (*Canis familiaris*), also are abundant. Efficient fishing techniques, such as weirs and traps, are believed to be in use by this time.

Unlike other regions of the Plateau, knowledge of the prehistory of the lower Snake is more complete for its earlier phases than it is during the later part of the temporal sequence. For example, the Piqúnin phase was known to occur only at one site when Leonhardy and Rice published their paper, and that site, Wexpusnime (45-GA-61), was being excavated at the time. This site, which is a village composed of circular housepits possibly fashioned of split poles covered with grass thatch, contained small, delicately-made projectile points (Leonhardy and Rice 1970:Figure 11) and numerous small utilized flakes. A variety of cobble implements (e.g., pounding stones, decorated pestles, hopper mortar stones, sinkers) are found along with a bone tool assemblages that includes matting needles and composite harpoon elements. Twined basketry also is known.

At the time Leonhardy and Rice wrote their paper, the economic fauna that was known from Piqúnin phase contexts primarily consisted of elk, deer, and salmon. The phase ends as the ethnographic period begins.

The Numípu phase is a putative construct intended to encompass archaeological manifestations of ethnographic Indian culture from the time of the introduction of the horse (shortly after A.D. 1700) to the time that Indians were relegated to reservations. The phase was proposed wholly on the basis of burials; only one habitation site had been tested in the lower Snake at the time Leonhardy and Rice proposed their regional chronology. The authors suggest that the period will be characterized by trade goods.

Leonhardy and Rice believe that historical or evolutionary relationships exist between their proposed phases; however, they also point out that until detailed comparative studies are made, such relationships cannot be described accurately. Nevertheless, sufficient information is available for them to hypothesize that two distinct cultural traditions occur in the region. They see Windust and Cascade as related historical developments representing a single evolutionary continuum and suggest the Lind Coulee assemblage as a likely ancestor for this tradition (Leonhardy and Rice 1970:25). A second evolutionary continuum appears during the Tucannon phase and extends through the Numípu phase. The authors are original in this suggestion; most researchers (except Caldwell and Mallory 1967) presume that a single evolutionary continuum is responsible for the cultural sequence.

Leonhardy and Rice's paper has a thoroughness comparable to that of Nelson's Sunset Creek effort, and it holds particular interest for studies along the middle Columbia because of the two separate traditions that the authors posit. The disjunction between the Tucannon and Cascade phases remains unexplained on the basis of Snake River data alone. Further data with which to test their hypothesis may occur along the middle Colum-bia because artifacts from this region closely resemble those found along the lower Snake.

Sun Lakes/Grand Coulee Project

During the late 1950s, archaeological salvage was undertaken in the lower Grand Coulee by Washington State College in connection with the development of a state parks system (Osborne 1959, 1967; Sprague 1960; Mallory 1962). In addition, the University of Washington excavated a rockshelter in the upper Grand Coulee in 1950 as part of archaeological salvage efforts associated with the construction of Banks Lake (Mills and Osborne 1952). Data recovered from these sites still constitute much of what we currently know about upland assemblages in the region. Evidence indicates that cultural use of the uplands occurs during the Late Cascade and Frenchman Springs phases and increases in intensity during the Cayuse phase. A housepit site at Blue Lake contained saucer-shaped structures dated at approximately 800 B.P. that are analogous to ethnographically described mat lodges.

Mesa (Grand Coulee) Project

During the mid-1970s, researchers from Central Washington University undertook a program of reconnaissance inventory and site evaluation in upland areas of the lower Grand Coulee. Rock alignments and other rock features were mapped and classified, and test excavations were used to augment surface data at sites containing evidence of midden accumulation (Smith 1977). Radio-

carbon dates and projectile points resulting from this work indicate that cultural use of the area occurred largely during the Cayuse phase (2,000 - 150 B.P.). Interestingly, none of the tested sites occur in situations where significant sedimentation is expected.

Chief Joseph Dam Project

Prior to the work reported here, several reconnaissance and survey projects were undertaken in the Rufus Woods Lake vicinity in connection with construction and modification of Chief Joseph Dam: Smithsonian Institution River Basin Survey (Osborne 1949), University of Washington (Osborne et al. 1952), Washington State University (Leonhardy 1970b; Lyman 1976), and Corps of Engineers, Seattle District (Munsell and Salo 1977). During this same period, several burials were removed and reinterred on the Colville Reservation by the University of Washington (1956) and University of Idaho (1973) under separate contracts with the Corps of Engineers, Seattle District. Additional survey-level investigations by the University of Idaho identified or confirmed the locations of several burial areas within project lands (Sprague and Miller 1978). Taken together, these studies indicate that the prehistory of this reach of the Columbia River differs markedly from that of the better-documented Sahaptin areas to the south. Most important, these studies strongly suggest that project area prehistory cannot be understood by extrapolation from adjacent areas.

River Basin Survey (1945 - 1950)

During the late 1940s, the Smithsonian Institution sponsored a reconnaissance program to inventory archaeological, paleontological, and historic resources in areas to be inundated by the initial pool raise behind Chief Joseph Dam. Results obtained from these investigations subsequently were used to recommend a program of cultural resources salvage. Reconnaissance inventory identified 20 archaeological sites within the anticipated pool area, and 11 of these were recommended for partial salvage excavation. Only the right (north) bank of the river was included in the survey; the investigators had concluded that the south bank was much less suitable for habitation.

University of Washington (1950)

Based upon previous reconnaissance results, the University of Washington initiated a small-scale data recovery program during the summer of 1950. Limited test excavations were completed at ten prehistoric and historic winter villages, open camps, and burial sites. Osborne and his co-workers concluded that the reservoir area displayed only minimal cultural variability and that cultural occupation and use of the area were comparatively late phenomena (Osborne et al. 1952). Although their conclusions were not substantiated by later investigations, several factors probably were responsible for these shortcomings. Their testing efforts concentrated upon sites with surface-evident structural remains (housepits). This no doubt resulted in an inadequate sample of other kinds of sites and also tended to exclude older sites from investigation; the latter typically lie buried under fluvial or aeolian sediments. Finally, their research was conducted at a time when knowledge of Northwest prehistory was little-developed and radiocarbon dating was not yet readily available. It is not surprising therefore that these researchers concluded that the area was occupied only relatively recently.

Washington State University (1969 - 1970)

Washington State University, under contract to the National Park Service, undertook renewed reconnaissance of the reservoir margins in 1969 and 1970 in anticipation of proposed modifications to the Chief Joseph dam and powerhouse. Reconnaissance inventory concentrated on areas along the north shore; however, they made spot checks along the south bank. Two previously unreported sites were identified within the project, and 17 sites were examined and assigned excavation priorities. Based on the resultant data, Leonhardy (1970b) concluded that the prehistory of north-central Washington exhibits marked differences from better known areas to the south and could not be understood on the basis of available information. He then went on to recommend a program for the salvage of data that would help fill in those gaps.

Washington State University (1975)

Washington State University carried out additional cultural resources investigations at the reservoir during the summer of 1975. These studies were limited to reappraisal of previously recorded sites and reconnaissance inventory along select segments of the shoreline (Lyman 1976). Reconnaissance added 15 prehistoric and nine historic sites to the inventory; altogether, 59 prehistoric and historic sites are described, including several that are not within current project boundaries. Thirty of these were

determined to be "significant" in terms of National Register criteria.

Test excavations at several prehistoric sites revealed a broader range of site types and artifacts than described previously. This suggested that the project area manifests more complex cultural patterns than envisioned by earlier investigators. Lyman (1976) concludes that the project area is a critical link for understanding and interpreting Columbia Plateau prehistory and recommends that a major effort be undertaken to preserve significant data.

U.S. Army Corps of Engineers (1976)

In October 1975, Corps of Engineers, Seattle District, staff archaeologist David A. Munsell made a brief reconnaissance of the project area to verify previous survey reports and evaluate the then proposed mitigation program of the National Park Service. Although his efforts were confined to a two-day field period, Munsell identified several previously unrecorded sites. Based on the apparent limitations of prior inventories, the Corps initiated an in-house program to identify all cultural resources within project guide-taking lines and to assess potential project effects on these properties. During winter and spring 1976, Corps personnel completed reconnaissance of approximately 60 percent of the area within their jurisdiction. They identified 192 previously unrecorded sites. This represents nearly a four-fold increase in the site inventory (previous investigators had recorded only 45 sites on project lands). Because reconnaissance was not completed on all project lands, Munsell and Salo (1977) estimated that as many as 400 sites could be expected to occur at the project and recommended further investigations to complete the inventory and to assess all potentially significant properties as the first step toward possible follow-on impact mitigation.

University of Idaho (1977 - 1978)

As part of a burial relocation program, the Corps contracted with the University of Idaho for a survey of the project to identify burial sites in previously unexamined areas, to confirm reported burial sites, and to estimate numbers of graves at each confirmed site. In addition to onsite survey efforts, investigators held interviews with tribal elders to assist in the identification of burials that could be affected by the project. The team identified and confirmed nine sites as well as several places that could be prehistoric cemeteries (Sprague and Miller 1979).

Summary of Regional Prehistory

Early (Pleistocene/Holocene Transition)

The Columbia Plateau apparently was first occupied about 12,000 years ago by small, highly mobile groups of hunters whose subsistence system focused on exploitation of larger game mammals; this corresponds to the Windust phase of Plateau prehistory. Apparently, the first populations arrived from the south or southeast along the Snake River plain. Many of the items included in their material culture inventory bear strong resemblances to implements characteristic of Great Basin variants of High Plains Paleoindian cultures. During the period from 12,000 to about 8,000 years ago, the climate was somewhat cooler and moister than at present.

First Intermediate Period (Early Holocene)

A pronounced warming and drying trend from about 8,000 to 4,700 B.P. accompanies the development of the Cascade phase. During this interval, people moved their residences frequently, but largely along the larger rivers. Animal and plant remains recovered from their dwelling and campsites suggest they were opportunistic hunters and gatherers; they ate whatever they could obtain, whenever and wherever they could obtain it. Paleoenvironmental records for this period suggest that the climate was drier and warmer than now, and economically important animal and plant populations may have been somewhat reduced. In several places, fishing seems to be an important subsistence pursuit.

Second Intermediate Period (Middle Holocene)

Between about 4,700 and 2,500 B.P., populations became more settled, but winter base camp locations still moved frequently. Sites exhibit more diversity, and animal and plant remains indicate specialized hunting and a greater reliance on food storage, which permitted a more settled existence. Fishing seems to be an economic focus. Populations may have increased during this time and concentrated in the northern part of the Plateau. Late in the period, population pressure along the rivers may have led to greater use of the uplands and increased reliance on fishing. The climate moistened, then grew cooler, likely increasing the abundance of animal and plant life available in each local population's territory.

Late Period (Late Holocene)

The Cayuse phase (ca. 2,500 - 150 B.P.) sees several changes in both environment and culture. The beginning of the phase (sometimes called Quilomene Bar) (2,500 - 2,000 B.P.) corresponds to the climatic shift from the Neoglacial's (ca. 4,000 - 2,000 B.P.) cooler, moister conditions to warmer, dryer, more modern circumstances. Forests retreated upslope and more open conditions prevailed. A pronounced mountain glaciation, which is known as the "Little Ice Age" (300 - 150 B.P.), seems to have been characterized by a colder, but not moister climate.

Although Quilomene Bar is represented by very few sites -- some have attributed this to decreased population levels -- this subphase seems to be the beginning of the establishment of the classic Plateau subsistence - settlement pattern that was typical of the region when Euroamericans first arrived in the early 1800s. Larger villages appear and are occupied for longer periods of time. Although fewer sites are known, this may be a consequence of population concentration rather than reduction. Fishing technology is elaborated and emphasizes efficient trap and weir techniques. The dryer, warmer climate may have decreased local upland food supplies and provided an impetus for adopting improved fishing methods.

About 2,000 years ago, more habitation sites begin to appear. This seems to coincide with the introduction of the bow and arrow, which further increased the efficiency of the economic system. Several changes occur in the use of upland areas. Fewer rockshelters are used as habitation sites; instead, they see use as storage caches. Greater numbers of open-air campsites with constructed shelters are evident. By and large, however, use of the uplands is poorly understood, as it is for all other periods.

Protohistoric Period

Major changes occurred in indigenous cultural patterns with the introduction of the horse: even greater use of long-favored fishing sites such as The Dalles and Kettle Falls resulted; upland resources were more intensively exploited; and greater intergroup contact occurred. Diseases also swept the region, wiping out entire villages and severely disrupting traditional lifeways.

During the 1920s and 1930s, ethnographers interviewed tribal elders from the Sanpoil - Nespelem and Sinkaietk (Southern Okanogan) to gather accounts of their ways of life prior to the impingement of Euroamerican cultural influence. The descriptions that resulted, although far from perfect, provide information that can be used to develop models of indigenous cultural systems that may have testable consequences in the archaeological record. Well-dated sites from the protohistoric and late Cayuse phases will be critical to testing such models for possible applicability to other times and places.

5. The Field Program

Conduct of survey-level investigations to meet the goals specified in the Corps SOW for the program entailed several different types of field activities (Figure 5.1). In this chapter I review our field investigations during the 1977 and 1978 seasons, emphasizing strategic and tactical decisions that conditioned the data base we used as the basis for all subsequent resource management decisions.

Resource Inventory

For any resource management program to be effective, we must know the numbers and kinds of resources under our stewardship. This is no less true for cultural resource management than it is for, say, wildlife management. Although prior inventory efforts had recorded 277 prehistoric and historic cultural properties, these investigations were far from complete; less than 60 percent of the reservoir area had been examined. Consequently, the first task facing us when we began work at the Chief Joseph Dam project area was to identify all cultural properties potentially subject to further management treatment.

The inventory team, which consisted of two crew members under the direction of Dr. William S. Dancey, examined previously unsurveyed portions of the project area using parallel pedestrian transects. Transect spacings were adjusted depending upon the number of crew members that were used along a given reach of the reservoir, the width of the area under investigation, and the character of the terrain. For example, reconnaissance personnel examined areas where cultural remains could be expected to concentrate (e.g., beaches, active alluvial cut banks, eroding margins of high terraces) in greater detail than areas where alluvial or aeolian processes likely had buried evidence of past human use. In general, the inventory team limited its attentions to terrain that reasonably could be expected to contain archaeological materials. Consequently, they typically excluded steep slopes and gulleys and bedrock exposures from their examination; however, they made exceptions where petroglyphs, pictographs, or rockshelters likely could occur.

Each team member recorded his or her transects on aerial photographs, which were carried into the field for referential control. When a site was identified, inventory personnel mapped its horizontal boundaries on this same aerial photo imagery as well as entering associated physical observations in surveyors notebooks.

Most of the prehistoric habitation sites identified by the reconnaissance team were observable only in vertical exposures; artifacts rarely occur on horizontal surfaces because active aeolian, colluvial, and alluvial processes have tended to bury such evidence.

The reconnaissance team examined 60 kilometers (37 mi) of shoreline during the fall 1977 season, 42 kilometers (26 mi) of which were previously unexamined; the remainder had been partially covered during the Corps 1976 inventory (Figure 5.2). Approximately 18 kilometers (11 mi) of previously unexamined shoreline were not examined because it consisted of bedrock or steep or disturbed terrain. An additional 5 kilometers (3 mi) could not be traversed because right-of-entry permits were not forthcoming from landowners.

The reconnaissa team identified 43 previously unreported cultu l properties: 27 prehistoric sites and 16 historic sites. Five of these (three prehistoric, two historic) occur outside the Corps guide-taking lines, which define the outside limits of the presumed area within which direct project impacts (through inundation or sloughing) will occur; these properties received no further management consideration. In addition, several sites were discovered inadvertently during the 1978 field season. While on inspection tours, Corps archaeologists identified two rockshelters -- one of which, 45-DO-325, also included several pictographs. Five additional pictograph sites were discovered by Daniel Leen during his efforts to document previously reported rock art locales (see Campbell 1984); one of these is outside project guide-taking lines.

Virtually all of the sites identified by non-reconnaissance personnel occur in areas that had been examined previously. This only serves to underscore the dynamic, ephemeral nature of archaeological surface inventor. Even under the best of circumstances, ground cover, erosion, and

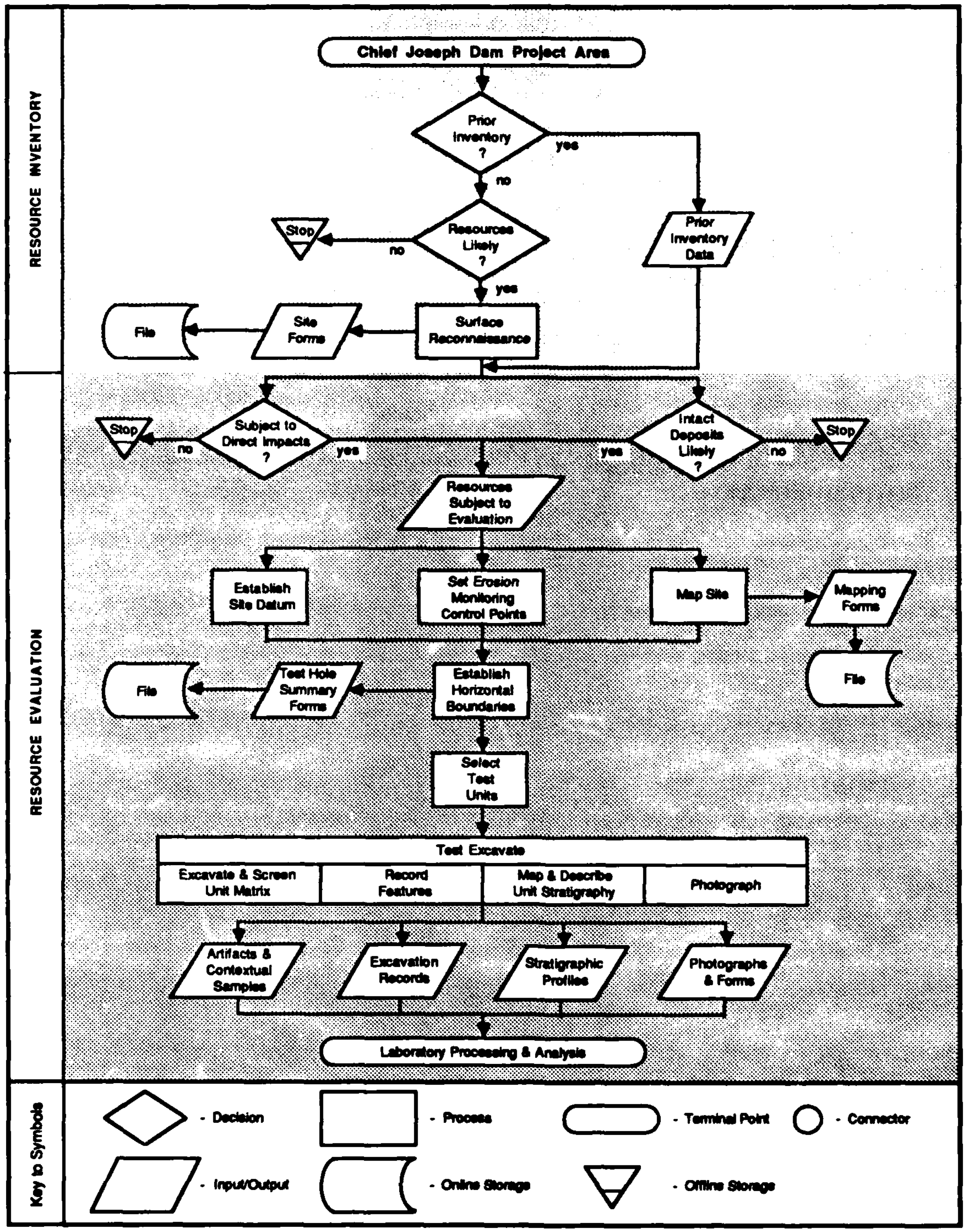

Figure 5.1. Generalized flow model for survey-level field investigations at prehistoric habitation sites.

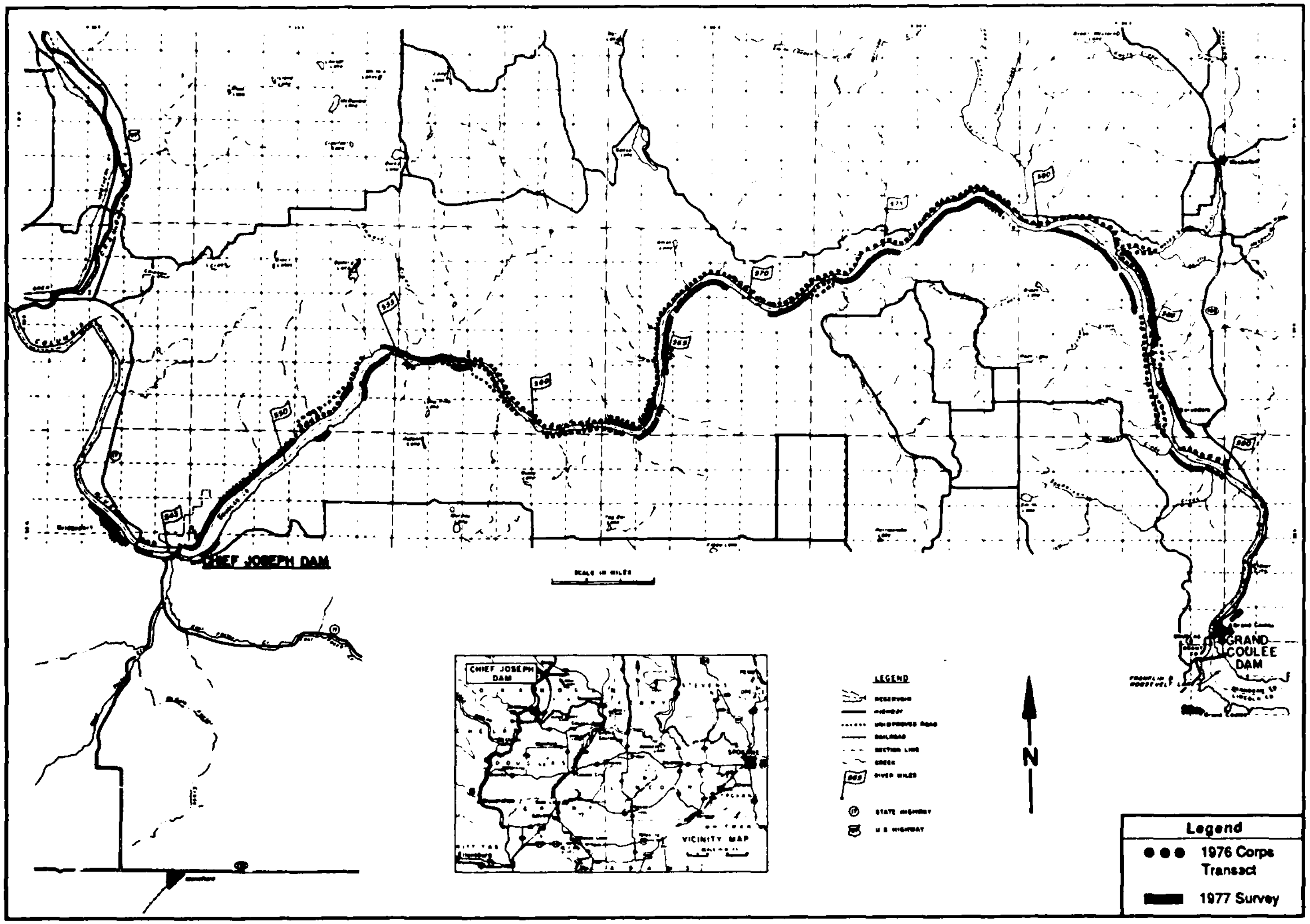

Figure 5.2. Locations of 1977 surface inventory transects.

other temporally variable factors exert profound influences on our ability to recognize evidence of past cultural activity. Consequently, we should never accept any inventory as complete.

Table 5.1 enumerates the results of all reconnaissance inventory efforts associated with the project according to the prehistoric site types defined by Munsell and Salo (1977:19), and Figure 5.3 portrays the spatial dispersion of the three prehistoric habitation site types: winter villages, open camps, and rockshelters. I again must stress, however, that the known resource inventory most likely does not include all prehistoric sites in the reservoir area. In addition to any surface-evident sites that may have escaped detection, numerous sites probably still lie buried beneath varying amounts of alluvial, colluvial, and aeolian deposits.

Table 5.1
Prehistoric Site Inventory

Site Type	Recorded Previously	Newly Recorded	Total #	%
Within Direct Impact Area				
Winter Village	43	1	44	17.8
Open Camp	103	17	120	48.6
Rockshelter	1	2	3	1.2
Burial/Cairn	62	6	68	27.5
Hunting Blind	1	0	1	0.4
Pictograph	5	5[b]	10	4.0
Cache	1	0	1	0.4
Sub-total	216[a]	31[c]	247	99.9
Outside Direct Impact Area				
Winter Village	6	0	6	18.2
Open Camp	9	2	11	33.3
Rockshelter	0	0	0	0.0
Burial/Cairn	10	1	11	33.3
Hunting Blind	3	0	3	9.1
Pictograph	1	1	2	6.1
Cache	0	0	0	0.0
Sub-total	29[d]	4	33	100.0
Total	245	35	280	---

[a] Total includes 11 binary sites
[b] One of these is associated with a previously recorded winter village
[c] Total includes one binary site
[d] Total includes two binary sites

Resource Evaluation

Although resource inventory gives us a general appreciation of the numbers and kinds of resources that potentially would be affected by the project, these properties are not all of equal importance to an understanding of regional prehistory. The second major facet of the survey field program -- site evaluation -- sought to provide just such data through the use of subsurface techniques to recover representative artifacts and contextual samples

Site Selection

To the extent practical and possible, we attempted to undertake onsite subsurface testing at all prehistoric habitation sites potentially subject to direct project impacts. Not all sites recorded in the inventory, however, warranted such further consideration. In addition to those properties occurring outside project guide-taking lines (Table 5.1), several sites had been inundated by the original pool raise, and numerous other properties no longer contained intact cultural deposits because of post-inundation bankside erosion. To determine which sites still exhibited primary archaeological deposits, the reconnaissance team visited all recorded habitation sites within direct impact areas and made a visual assessment of each property. The results of their efforts are presented in Table 5.2.

Table 5.2
Status of Prehistoric Habitation Sites within Direct Impact Areas

Site Type	Recorded	Inundated	Severely Eroded	Subject to Evaluation
Winter Village	44	4	1	39
Open Camp	120	2	42	78
Rockshelter	3	0	0	3
Total	167	6	43	120

Of the sites containing sufficient intact deposits to warrant evaluation, ten had been tested by previous investigators; three other sites also had been tested but had been inundated by the original pool raise. In all but one case, adequate data were available for us to recommend additional management treatment, and we excluded these sites from our testing program. Of the 111 remaining sites, we selected 79 for subsurface testing (Table 5.3; Figure 5.3). The overwhelming majority of sites that we elected not to test occur above or away from areas

subject to inundation or immediate erosion from increased pool operating levels.

Table 5.3
Tested Sites within Direct Impact Areas

Site Type	Subject to Evaluation	Previously Tested	Newly Tested	Total #	Total %
Winter Village	39	9	27	35[a]	89.7
Open Camp	78	1	50	51	65.4
Rockshelter	3	0	2	2	66.7
Total	120	10	79	88	73.3

[a]One winter village was tested previously

We tested 27 sites during the fall 1977 field season. Most of these occur in the central part of the reservoir along the north (right) bank, where easy road access was available. During 1978, we concentrated our efforts at more inaccessible sites, such as those requiring boat access.

Site Preparation and Mapping

Once we selected a site for subsurface evaluation and had scheduled investigations, we began preparations for our onsite sampling efforts. The first step in this process was to establish a temporary benchmark (or site "datum") that we could use for local referential control. In placing each site datum, field personnel sought to satisfy several criteria:

- The site datum should be easily observed in aerial photographs;
- The site datum should be sufficiently above proposed new operating pool levels to avoid immediate inundation or subsequent erosion;
- The site datum should be visible from all local cultural and natural features; and
- The site datum should be placed sufficiently away from surface-evident cultural features (e.g., housepit depressions) that subsequent excavations would not require its removal.

Satisfying the third criterion often proved unfeasible. Many of the sites we selected for test evaluation occurred on low, level terraces below steep banks or hillsides, areas subject to inundation or erosion. In such circumstances, tactical needs had precedence, and we established site datums so as to satisfy the other locational criteria.

Site datums consist of 2-inch by 2-inch wooden surveyors' stakes set in concrete flush with the ground surface. We painted the top of each stake red and inscribed the site number in the concrete before it set; we also cleared the area around each datum for a radius of 5 meters to make it more visible to both ground and airborne personnel.

In addition to this "primary" datum, we established a secondary datum at each site to provide further local referential control. Each secondary datum, which also was set in concrete flush with the ground surface, was placed 30 meters downstream from the primary datum on a line approximately parallel with the river margin. By projecting a line through the primary and secondary datums at each site, we could establish accurately the positions of all local cultural and natural features, including the locations of test excavation units. This we accomplished either by triangulation to the two datums or by reference to a square (or cartesian) grid system in which one axis (the east-west) was determined by the line through the primary and secondary datums and the other axis (the north-south) lay perpendicular to the east-west axis and crossed through the primary datum. We used the first method during the 1977 testing season and the second in 1978.

Following the establishment of a site's primary and secondary datums, the field team mapped each property and its immediate environs (scale: 1 in = 10 m) with reference to the local referential system. In addition to specifying all important cultural and natural features, we measured the locations of any erosional cut-banks occurring in the immediate vicinity that might be altered by changing pool levels. These measurements, if periodically repeated after the pool raise, would provide accurate data about local erosion rates that could be used for long-term resource management.

More detailed locational data were gathered for all surface-evident depressions that might represent remnants of housepits, storage pits, mat lodges, or sweat lodges. The survey-mapping team established a 1-meter by 1-meter square grid over each feature and recorded surface elevations at all grid intersections. These data provided the means for us to prepare detailed computerized contour maps of all features that we could use to help plan subsequent data recovery. We also used

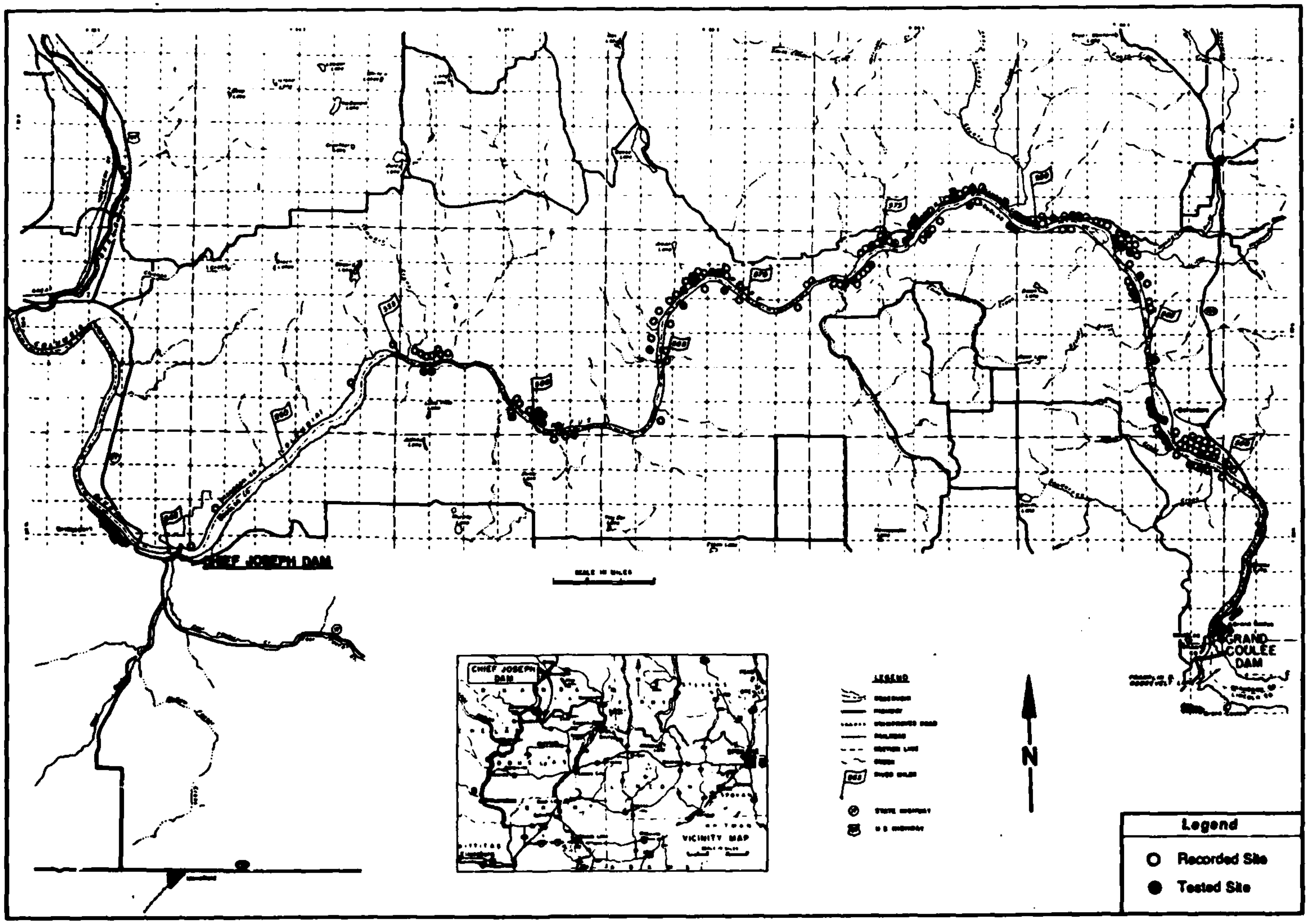

Figure 5.3. Recorded and tested prehistoric habitation sites.

information about the number and size of these features in classifying sites for management purposes (see Jermann et al. 1978:Tables 2-4).

Although locational data produced by the survey-mapping team provided useful information about the relative locations of cultural and natural features at each site that testing teams could use to guide their efforts, they could not be used to prepare detailed topographic maps that were referenced to a regional-scale coordinate system (e.g., Universal Transverse Mercator). This need was met with controlled aerial photo imagery. Immediately following the spring 1978 testing season, the Corps completed a low-level aerial survey of the reservoir. Just before this fly-over occurred, our survey-mapping team revisited all sites we had tested and placed cloth aerial photo targets over all primary and secondary datums. In addition, they established a third datum at each site at a point 30 meters from both the primary and secondary datums; this datum too was marked by a cloth target. The resultant equilateral triangle provides three known points from which detailed site-specific topographic maps easily may be prepared. Although cost considerations prevented us from mapping all testing sites, the Corps did eventually prepare such maps for most sites where follow-on data recovery occurred.

Shovel Testing

Following establishment of a local referential system and preparation of a site sketch map, our attentions focused on evaluating site content, horizontal and vertical structure, and age. In this regard, our first task was to determine the general horizontal and vertical extent of a site's cultural deposits so that we could develop a sampling plan for test excavations. At the start of the 1977 survey season, we tried to use hand-operated mechanical soil augers for this purpose; however, this technique proved unfeasible. The dry, sandy sediments that typify the project area are not conducive to use of a soil auger -- augers tend to bore their way downward without bringing sediments to the surface. We quickly abandoned augering and substituted a shovel testing program in its place.

Shovel testing consisted of excavating a series of small, circular (diameter = 30-50 cm) holes along at least two transects oriented to the site grid. Typically, these transects were perpendicular to one another and sited so as to quarter the site. We began testing outside the suspected site limits, which often were determined from the distribution of lag deposits along active erosional surfaces, and proceeded inward along each transect. We discontinued further shovel testing along a transect upon encountering cultural materials; this tactic reduced chances of disturbance to intact deposits.

Field personnel screened the soil from each test hole through quarter-inch hardware cloth and bagged and catalogued all cultural debris by test hole. Potentially diagnostic artifacts such as projectile points were bagged separately and their provenience depth estimated. We recorded the locations of all test holes and backfilled them immediately.

The small diameter of shovel hole excavations precluded us from sampling site deposits extending to depths in excess of approximately 1 meter. Despite this limitation, data from subsequent test excavations suggest that shovel testing did, in fact, identify most site occupation components. In addition, this program allowed us to establish a site's minimum horizontal limits with a fair degree of accuracy.

Surface Collection

Where possible, field personnel collected surface-evident cultural materials to supplement subsurface assemblages; however, most sites in the project area contained no such evidence, and opportunities for surface collection were relatively rare. For those sites where suface collection was warranted, we typically used one of two strategies. In a few instances (e.g., 45-OK-310, 45-OK-313), artifacts were exposed on horizontal surfaces. In such circumstances, field personnel made controlled, systematic collections of the entire site surface. In other cases (e.g., 45-OK-250), artifacts occurred only as erosional lag deposits along vertical exposures. Here, we collected only diagnostic artifacts (e.g., projectile points, formed tools) that might prove useful for subsequent site temporal attributions. By and large, however, surface collection constituted only a relatively minor aspect of the field program, and subsequent site interpretations in no way depend upon the resultant data.

Site Testing

Controlled excavation of test units was the final and most important phase of the survey's field investigations. Although Corps' contract specifications prescribed many of the strategic elements of the program, we had considerable latitude in putting their requirements into

practice. Consequently, the discussion that follows emphasizes tactical decisions involved in site testing.

Test Unit Selection

Because of the available funds and time with which to complete resource evaluations and implement an effective management program, the Corps established a 0.2 percent areal sampling fraction for survey-level investigations at the project. Many of the sites we selected for testing, however, were so small that this would have required us to excavate less than one square-meter of site deposits. This simply wasn't practical; a 1x1-meter unit, or preferably a 1x2-meter unit, is needed to excavate deposits deeper than 1 meter with any degree of control, particularly in unconsolidated sandy soils. In addition, we felt more than one test unit was needed at each site to provide sufficient data for making reasoned management decisions. Consequently, we decided, with Corps concurrence, that we would excavate at least two test units at all sites where adherence to the contract-specified sampling fraction would have resulted in fewer units.

In 1977, we selected test unit locations using probabilistic sampling schemes. The decision to adopt probabilistic sampling was predicated on our desire to recover enough data to allow us to generate reliable estimates of site contents. Many of the sites subject to evaluation that first season, which, at the time, we expected to be the only testing season, were sufficiently large that a 0.2 percent areal sample should have been adequate for such characterizations. This proved not to be the case, however. Our analysis of 1977 data indicated that variability among test units at a given site tended to be as great as the variability among sites. Consequently, during the 1978 testing season, we decided to abandon probabilistic sampling and use judgmental sampling instead. Under this unit selection regime, field personnel chose test unit locations so as to maximize recovery of cultural materials. Typically, these decisions were based on observations of surface-evident remains and erosional lag deposits.

One selection criterion remained constant throughout the survey program. During both field seasons, we made a conscious effort to avoid placing test units within surface-evident cultural depressions such as housepits. Although such features might have yielded substantial amounts of cultural debris, the resultant data often are difficult to interpret without access to areal samples far in excess of those we could hope to recover as part of these investigations.

Test Unit Excavation

We used 1x2-meter units for all site evaluations. Our choice of this unit size was based both on the kinds of sediments occurring in the reservoir and on the vertical extent of cultural deposits at most sites. Typically, the sediments in this area are sandy silts or silty sands that exhibit little structure, and cultural deposits extend to depths in excess of 1 meter, circumstances that cannot be accessed efficiently or safely with smaller-size units.

We oriented all test units with their long axis perpendicular to the reservoir or to the prevailing topography. The northwest corner of each unit (the "unit datum") provided local horizontal and vertical referential controls:

- A unit's horizontal location was specified by reference to the north-south and east-west metric distances of the unit datum from the site datum; and

- Internal unit elevations were specified with respect to the unit datum elevation (unit datum = 0 m elevation).

Field personnel excavated units primarily by shovel within arbitrary 10-centimeter vertical levels. Although we would have preferred to excavate according to natural or cultural stratigraphic units, the sedimentary matrix of most sites exhibit such subtle strata that arbitrary excavation levels offer the only practical means of vertical control. We measured and designated excavation levels with reference to their depths above or below ground surface at the unit datum (Figure 5.4). For example, Unit Level (UL) 10 refers to the excavation level that encompasses materials occurring between 0 and 10 centimeters below the unit datum surface elevation. Negative (below ground) values are implied for UL designations. We used plus (+) levels to designate materials occurring above unit datum; for example, UL+10 refers to the matrix occurring between 20 and 10 centimeters above unit datum.

Horizontal control was maintained by dividing each 1x2-meter test unit into two 1x1-meter squares (or quadrats); we designated the northernmost quadrats "A", the southernmost "B". All cultural materials and records for agiven test unit maintained these distinctions. All sediments from each quadrat unit level were

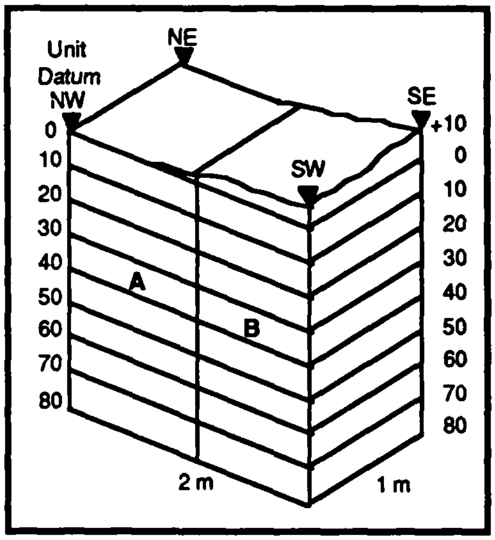

Figure 5.4. Schematic of major test unit referential features.

screened through one-quarter inch hardware cloth, and retained cultural materials were separated from noncultural detritus and bagged by unit level and quadrat. Excavators counted and weighed all fire-modified rock (FMR) and recorded the information on unit level bags and field forms before discarding this material.

Field personnel exercised particular care upon encountering cultural features such as fire hearths or earth ovens. Once a feature was defined and outlined during excavation, we prepared a plan map of its upper surface. We then bisected the feature, excavating half its contents using a series of separate, arbitrary 10-centimeter levels; feature contents were screened, bagged, and catalogued separately from general unit level contents. Where possible, bulk samples of feature fill were collected for subsequent flotation and analysis. Once a feature was exposed in profile, excavators mapped and described its internal stratigraphy before removing its remaining half. Where possible, excavators removed feature fill using unit levels subdivided according to observable natural/cultural stratigraphic units. In instances where a feature was truncated by one or more walls of the test unit, we placed labelled tags in the wall to show the feature's location to assist in subsequent unit stratigraphic mapping and description.

Because a major goal of the survey program was to establish the temporal placement of all cultural deposits, excavators made a concerted effort to recover samples (e.g., charcoal) that might prove useful for this purpose. Although feature contexts normally would have afforded the best opportunities to recover such samples, these circumstances were relatively rare, and we often had to rely on samples recovered from general unit level contexts. In either instance, however, excavators separated charcoal from other cultural debris and wrapped it in aluminum foil to prevent possible contamination by contemporary organic materials. Where possible, we attempted to recover charcoal samples in situ so that we could establish their cultural contexts. As was the case for features, excavators placed labelled tags detailing catalog and provenience information for each sample in the nearest test unit wall to provide a convenient reference during later stratigraphic recording.

The depth to which field personnel excavated a test unit varied according to local circumstances. Generally, we continued excavations until encountering an impenetrable geologic stratum (e.g., bedrock, caliche, basal cobble substrate) or until reaching archaeologically sterile matrix, which was defined as two or more successive unit levels at depths in excess of 1 meter that contained no cultural materials. In certain instances, however, we terminated testing for safety reasons. The unconsolidated sandy matrices that characterize the project area are highly unstable, and the possibility of unit wall collapse became an overriding concern with excavation depths in excess of 2 meters.

Once we completed excavation of a test unit, we mapped and described its stratigraphy on scaled (1 in = 50 cm) drawings. The number of test unit walls we recorded varied according to unit complexity, but, in general, we chose the two intersecting walls that best typified the unit. Bulk samples of observable natural or cultural strata were extracted for subsequent physical or chemical analyses, and the locations of such samples were recorded. We took both black-and-white and color photographs of all test units to provide an independent, permanent record of unit stratigraphy.

The tactics we used for recording site stratigraphy differed between the two field seasons. During fall 1977, our two Field Supervisors were responsible for stratigraphic profiling of all test units excavated by crews under their supervision. This strategy had to be changed for the second season, when four or more field crews operated simultaneously, and more than 50 sites were subject to test evaluation within a two-month period. In 1978, we established a separate,

independent field team whose sole responsibility was to map and describe the stratigraphy of all test units. This team was made up of three personnel: the Pedologist, who supervised all work efforts, and two assistants.

Field personnel backfilled all test units upon completion of onsite excavations and stratigraphic profiling, and we made a concerted effort to return each site to its pre-survey condition. Altogether, we excavated nearly 600 cubic meters of soil matrix from 543 units at 79 sites.

6. THE LABORATORY PROGRAM

Because of the limited time between survey-level investigations and possible follow-on efforts at any site, we carried out laboratory processing and analysis of testing data concurrent with field operations. With the exception of faunal analysis, which specialists completed at the University of Washington Department of Anthropology, all laboratory work was undertaken at our field base.

A variety of tasks were involved in this aspect of the survey program (Figure 6.1), and in the sections that follow, I describe these activities, emphasizing strategic and tactical decisions that ultimately condition the data base we use for all subsequent interpretations. In addition, I discuss the general results of several facets of the laboratory program where assemblage-wide data are interesting in themselves or are used to develop lines of inquiry for later site-specific analyses.

Laboratory Processing

Laboratory processing consisted of sorting, cleaning, counting, and weighing all cultural materials from each unit level of each test unit at each tested site. Processing of a given unit commenced only after field personnel had completed its excavation. Laboratory personnel first sorted the contents of each level bag according to major material categories: lithics, shell, bone, and charcoal. Lithics were soaked in a mild solution of trisodium phosphate (TSP) -- a readily availble industrial deflocculating detergent agent -- rinsed, and then ultrasonically cleaned. Shells were brushed gently to remove adhering soil matrix. Bone were gently washed in water to remove major soil matrix inclusions, and highly friable specimens exhibiting evidence of possible wear or manufacture were soaked in a solution of water and Elmer's™ Glue and air-dried to help ensure specimen structural stability. Laboratory personnel counted and weighed each material category and recorded the information on laboratory catalog (LABCAT) forms along with similar data taken in the field for fire-modified rock (FMR).

We treated charcoal with particular care, assigning a single individual to process all samples. This person oven-dried each sample and carefully removed intrusive, noncarbonized materials from all samples with a pair of tweezers; smoking was not permitted in the processing area in an effort to prevent sample contamination. Cleaned samples then were weighed on an electronic balance to the nearest 0.1 gram, and this information, along with sample provenience data, was catalogued for future reference. Finally, the processor sealed each sample, which was first wrapped in aluminum foil, in a plastic bag. Samples weighing in excess of 1 gram that potentially could be used to help determine the chronological placement of site deposits were forwarded to the University of Texas Radiocarbon Dating Laboratory for further analysis. Samples of less than 1 gram were curated, and they may provide future researchers a means of making additional temporal attributions.

Table 6.1 summarizes the material contents of all tested sites and provides information about the total number and volume of all test units. These data are the basis for all subsequent site analyses, interpretations, and management recommendations. Before going on to discuss the analytic schemes we use to specify the nature of formal, temporal, and spatial variability among the project area's prehistoric habitation sites, it is important to note that not all of the sites listed in Table 6.1 are included in subsequent analyses. As a consequence of field and initial data processing efforts, we determined that several sites were no longer sufficiently intact to warrant further management treatment. These sites are identified in Table 6.1 and are excluded from any further consideration here.

Laboratory Analysis

Analyses of testing data varied depending upon the type of material under consideration. In the sections that follow, I describe the classificatory systems we used for the various constituents of the testing assemblage. In subsequent chapters, I use many of these classifications to analyze formal, temporal, and spatial variability among prehistoric occupation components occurring at the project; however, I present and discuss certain general reservoir-wide, nonsite-specific results in this chapter, particularly where these results help guide follow-on analyses and interpretations.

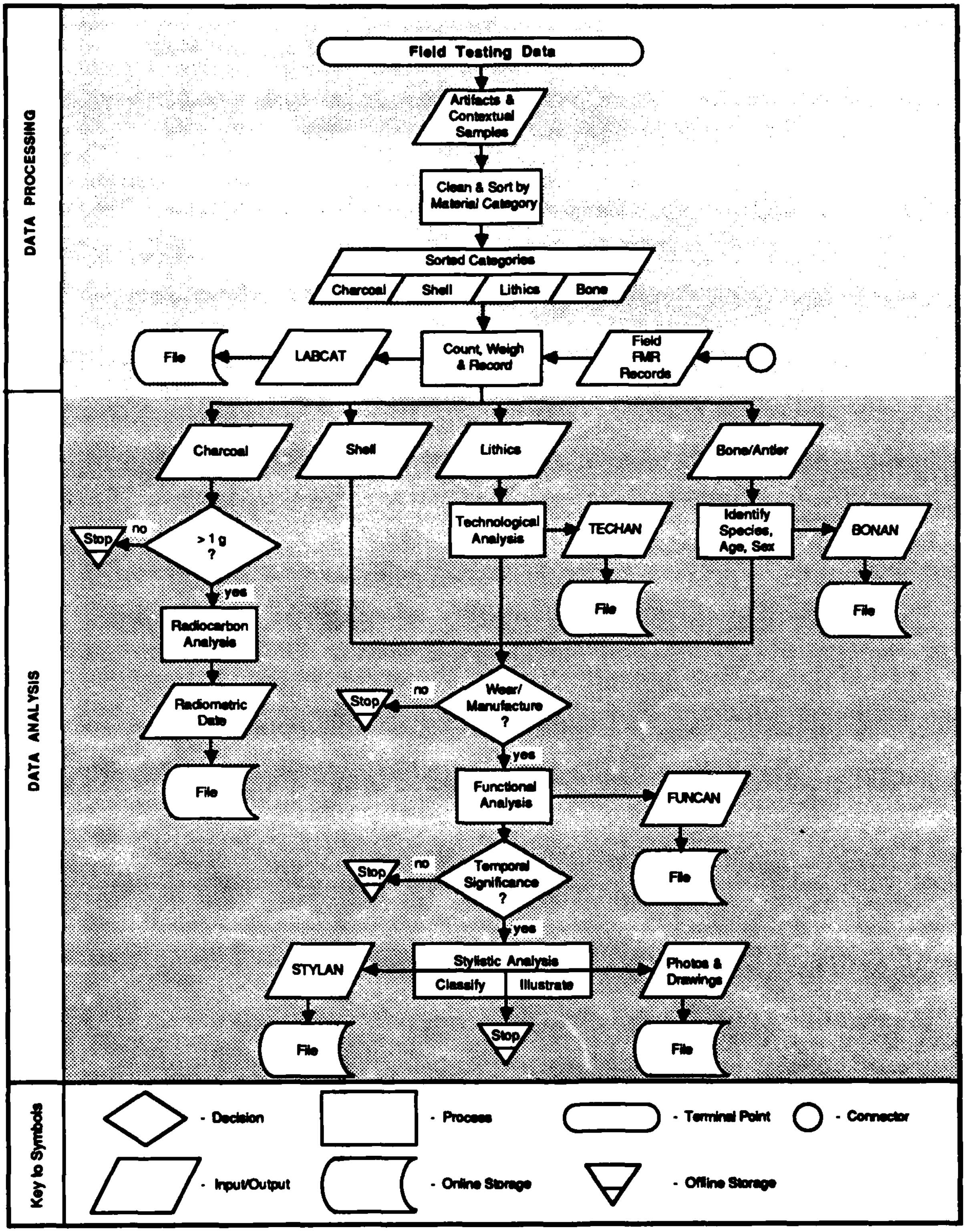

Figure 6.1 Generalized flow model for data processing and analysis.

Table 6.1
Contents of Tested Sites by General Artifact Classes

SITE	Units #[a]	Excavated Volume (m^3)	Bone #	Bone Wt.(g)	Shell #	Shell Wt.(g)	FMR #	FMR Wt.(g)	Lithics #
45-DO-102	6	5.7	53	130	0	0	101	7,626	56
45-DO-188	4	4.7	24	8	0	0	0	0	158
45-DO-198	16	18.3	147	82	0	0	2	250	110
45-DO-204	9	11.7	1,059	438	0	0	187	45,195	217
45-DO-211	7	11.0	441	311	2,913	9,283	7	1,140	348
45-DO-212[b]	4	4.4	0	0	0	0	0	0	0
45-DO-213	4	3.5	43	32	4	37	5	275	29
45-DO-214	6	8.1	798	407	250	—[c]	160	11,049	387
45-DO-215	4	6.0	37	37	112	607	5	560	94
45-DO-220	4	5.6	4	2	0	0	7	900	25
45-DO-221	6	7.0	5	4	0	0	0	0	7
45-DO-222	4	4.3	2	4	0	0	1	700	21
45-DO-233	4	4.5	8	4	6	2	40	3,955	28
45-DO-234	4	5.6	82	39	0	0	11	837	4
45-DO-235[b]	4	4.5	18	5	0	0	2	60	0
45-DO-236[b]	4	4.6	0	0	0	0	8	1,600	0
45-DO-242	6	9.0	538	516	747	4,864	47	9,142	87
45-DO-243	4	5.2	239	189	0	6	9	1,400	77
45-DO-248	4	3.8	6	6	15	30	18	2,670	59
45-DO-249[b]	4	5.8	261	170	1,307	5,352	146	17,038	194
45-DO-254	4	7.0	344	217	1,570	4,225	102	13,871	71
45-DO-262	4	4.5	0	0	0	0	9	955	29
45-DO-26[b]	8	5.2	1	2	0	0	1	1,340	6
45-DO-271[b]	4	3.8	1	2	0	0	0	0	0
45-DO-273	4	5.7	12	12	0	2	5	1,220	58
45-DO-274[b]	4	4.6	0	0	0	0	1	150	2
45-DO-276	4	5.1	1,156	446	3	10	58	12,010	205
45-DO-282	12	20.9	147	86	0	6	0	0	1,037
45-DO-284	10	6.7	48	174	0	0	77	22,278	35
45-DO-285	4	4.9	1,521	1,758	0	0	176	18,722	1,576
45-DO-312	4	5.2	1	2	0	0	0	0	37
45-DO-325	6	2.3	643	438	120	374	130	36,525	650
45-OK-2A	16	20.4	364	306	769	—	455	42,318	141
45-OK-11	34	41.5	4,364	5,214	1,590	—	880	83,207	885
45-OK-12	4	7.2	707	314	419	1,505	72	8,968	38
45-OK-18	6	5.1	24	26	0	0	87	8,115	79
45-OK-20	20	17.8	1,508	866	55	—	783	56,067	812
45-OK-28	4	3.0	6	36	0	0	4	230	0
45-OK-158	6	4.5	451	316	0	0	169	22,830	70
45-OK-168	4	5.2	410	299	1,812	7,026	277	40,856	201
45-OK-226	4	3.6	22	51	0	2	101	12,120	164
45-OK-229	12	8.9	59	102	0	0	131	36,662	84
45-OK-230[b]	4	2.0	0	0	0	0	3	340	1
45-OK-235[b]	4	3.9	0	0	0	0	0	0	0
45-OK-237[b]	6	5.8	2	2	0	0	0	0	1
45-OK-239	14	18.3	2,289	1,331	707	—	753	120,634	1,424
45-OK-244	6	3.6	23	23	55	—	159	28,904	124
45-OK-245	4	3.9	111	68	47	—	106	9,020	563
45-OK-246	4	3.9	35	40	0	6	2	64	9
45-OK-247	4	2.6	0	0	0	0	0	0	42
45-OK-248	6	8.8	117	101	899	5,160	80	8,738	99
45-OK-250	6	10.1	3,017	1,232	1,116	4,443	134	12,838	377
45-OK-253	4	6.0	425	343	1,214	6,198	51	6,826	40
45-OK-254	10	9.6	290	163	77	—	71	4,970	71
45-OK-255	8	14.4	1,055	350	197	980	29	4,254	83

Table 6.1 (Continued)

SITE	Units #[a]	Excavated Volume (m^3)	Bone #	Bone Wt.(g)	Shell #	Shell Wt.(g)	FMR #	FMR Wt.(g)	Lithics #
45-OK-256	4	4.0	708	462	396	1596	49	6,228	66
45-OK-257	12	15.8	4,031	1,859	771	3,279	387	29,541	485
45-OK-258	10	12.6	1,465	1,092	1,361	---	533	60,234	275
45-OK-259	4	2.9	3	5	0	2	7	485	5
45-OK-261	4	3.1	3	6	0	4	33	3,199	26
45-OK-264	4	6.2	22	10	4	68	16	380	6
45-OK-265	14	10.7	124	138	1	0	119	6,640	37
45-OK-274	8	4.6	2,142	1,170	77	---	2,354	104,056	210
45-OK-275	14	18.6	1,881	1,352	40	---	422	52,809	529
45-OK-280	16	21.5	401	352	1,435	---	207	23,665	211
45-OK-287	4	2.1	17	14	2	22	58	10,510	26
45-OK-288	4	6.4	336	141	0	0	70	12,320	76
45-OK-289	4	3.6	13	4	0	0	0	0	4
45-OK-292	8	6.9	198	123	43	---	236	26,396	238
45-OK-303	6	4.6	3	6	0	20	0	0	8
45-OK-309	6	7.8	19	24	1	39	1	90	283
45-OK-310	6	2.9	0	0	0	0	5	728	23
45-OK-311	10	8.9	1	2	0	0	114	2,338	19
45-OK-312	6	4.8	12	16	0	0	29	394	19
45-OK-313	5	3.0	2	9	8	---	14	910	39
45-OK-314	4	1.8	0	0	0	0	0	0	4
45-OK-338[b]	4	3.7	0	0	0	0	0	0	0
45-OK-340	4	4.4	0	0	4	18	0	0	7
45-OK-347	16	17.7	33	34	5	52	4	263	75
Total Count	543	597.9	34,332	23,523	20,152	55,218	10,320	1,060,615	13,586
Density[d]			57.4	39.4	33.7	132.4	17.3	1,774.5	22.7

[a] Number of 1x1-meter quadrats
[b] Sites requiring no further management consideration
[c] Not reported
[d] Value per cubic meter

Shell

Although freshwater molluscs are a major constituent of the cultural assemblage, specimens almost universally can be attributed to subsistence use; with the exception of one piece of dentalium, no shells in the testing assemblage are modified as tools or ornaments. Consequently, our analysis of this material ended once we counted the number of hinges by species in each unit level, an activity that was undertaken as a part of normal laboratory processing.

Virtually all shell recovered during testing is attributable to a single species (*Margaritifera falcata*). The only exception to this comes from one unit at one site (45-OK-239), where 30 hinges of *Gonidea angulata* occur along with 501 hinges of *M. falcata*. Importantly, the distributions of these two species are not uniform throughout the test unit; *G. angulata* is concentrated in deeper unit levels. Because this species prefers still water and muddy bottoms and *M. falcata* prefers some current and sandy to gravelly bottoms, it is possible that the local riverine environment adjacent to this site changed at some time in the past, resulting in a shift in the relative availability of the two species. If such a shift occurred, however, it apparently was a localized phenomenon because no other specimens of *G. angulata* occur in the entire testing assemblage.

During most of the analytic program, laboratory personnel counted all shell hinges and weighed all shell fragments that were larger than one-half inch (1.27 cm) in any dimension. Because of the abundance of this material and the processing

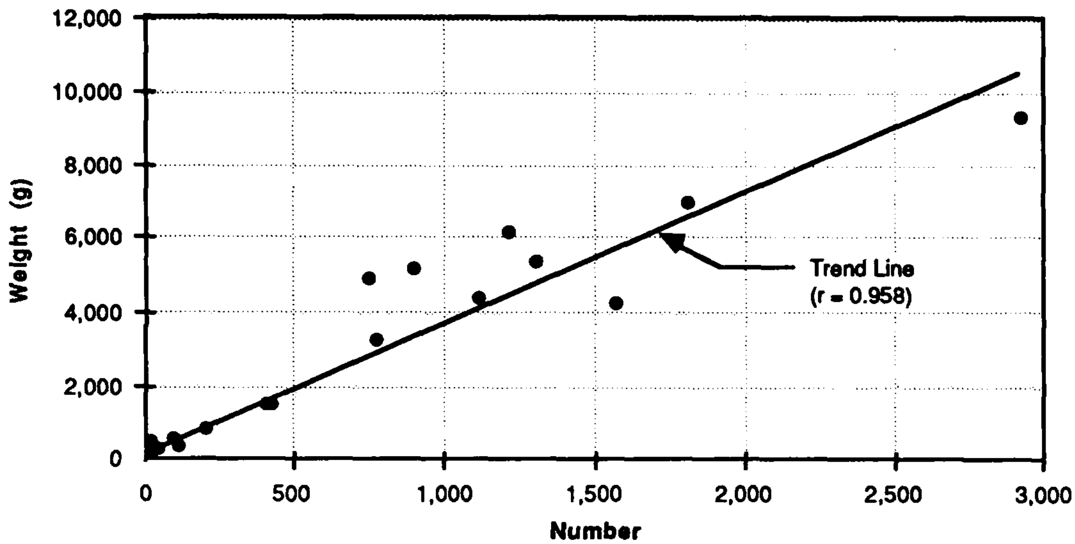

Figure 6.2. Plot of shell weight versus number for selected testing site assemblages.

time required to clean samples for accurate weighing, we undertook an analytic program to determine whether the number of hinges and weight of shell were sufficiently correlated that we could discontinue weighing and rely solely on hinge counts. Using data from 65 of 79 tested sites -- only 24 of which contain any hinges -- we plotted weight versus number and also computed the linear regression trend line between these two variables (Figure 6.2). As can be seen from this display, shell weight is highly correlated with hinge number (r = 0.958), and consequently, we feel confident that hinge counts provide an appropriate representation for this material category.

Bone/Antler

The substantial amounts of vertebrate faunal material occurring in the testing assemblage potentially are useful for inferring the character of local site environments and regional subsistence systems. A variety of analyses are useful in investigating these problems, and our efforts accordingly were directed toward specifying assemblage variability along several lines:

- Taxonomic composition and abundance;
- Population age and structure;
- Butchering patterns; and
- Seasonality.

In the sections that follow, I describe the methods we used to analyze the vertebrate faunal assemblage for these characteristics. Laboratory processors and faunal analysts also examined all specimens for evidence of tool manufacture or use. Such artifacts were included with worn or manufactured lithics for functional and stylistic analyses, and thus are treated elsewhere.

Taxonomic Composition and Abundance

Following laboratory processing, we transported faunal remains to the Department of Anthropology at the University of Washington, where Drs. R.L. Lyman and J.C. Chatters completed all further analyses, except functional and stylistic classifications. Taxonomic identifications made extensive use of private comparative collections as well as collections held at the Thomas Burke Memorial Washington State Museum, the University of Washington, and the University of Puget Sound Museum of Comparative Zoology. In addition, faunal analysts consulted several published keys (e.g., Hildebrand 1954, 1955; Olsen 1964, 1968; Boessneck 1969; Schmid 1972; Gilbert 1973, 1980; Glass 1973). Each specimen was examined macroscopically, and depending upon its size and condition and the number of observable diagnostic features, each was assigned to its most specific identifiable taxonomic level -- order, family, genus, or species. In many instances, mammalian

specimens are not identifiable below the level of family, or even order; however, analysts often could determine whether such specimens are attributable to large herbivores (e.g., deer, elk, antelope), small herbivores (e.g., marmot, jackrabbit, cottontail), carnivores (e.g., coyote, badger, cougar), or rodents (e.g., squirrel, pocket gopher, pocket mouse). Because even this level of categorization potentially provides important information about subsistence patterns, we recorded these more generic identifications along with genus or species-specific data. Where possible, analysts also recorded their identifications of skeletal element, side, position, and portion.

We used a single measure of taxonomic abundance to categorize the faunal assemblage -- the number of identifiable specimens of a taxon (NISP). Although we also could have used other measures such as minimum number of individuals (MNI), the biases associated with such measures (cf., Grayson 1979) made them less susceptible to interpretation. Table 6.2 lists NISP for each taxonomic category occurring in the testing assemblage. As might be expected from regional ethnographic data, deer are the most regularly exploited mammals; however, antelope, elk, and mountain sheep also occur frequently. In addition, marmot and turtle appear to have been common constituents of the local diet.

Although ethnographic data indicate that freshwater mussels were not particularly prized as food and were used to tide people over during times of food shortage, the amount of shell occurring in the faunal assemblage would seem to suggest otherwise. Perhaps this apparent disparity is due to changes in food preferences between the prehistoric and historic periods. For example, it is possible that, with the introduction of the horse and the accompanying mobility this innovation afforded, greater status was attached to hunting large, mobile terrestrial mammals and that lower status was accorded to shellfish, which could be gathered virtually at anytime or anywhere along the river. Adequate resolution of this problem, however, would require comparisons of representative samples from both prehistoric and historic sites, an exercise beyond the scope of the testing program.

The paucity of fish bone in the assemblage may seem at odds with the importance attached to this resource in the ethnographic record. A review of ethnographic data concerning butchering practices used for fish, however, suggests a possible reconciliation. These descriptions indicate that Plateau peoples prepared fish for consumption using a filet process in which the head was removed and two filets were separated from the vertebral comun. Most important, the vertebrae were either discarded or crushed for soup (cf., Lyman 1976b:28-31). Consequently, because "fishing was conducted at low water and the fish were fileted in areas which were frequently inundated at high water, countless fish bones would normally never find their way into site middens" (Nelson 1969:56).

Population Structure

Although the age structure of a faunal population may provide useful indicators of predation methods, diet, and season of exploitation, only deer bone occurred in sufficeint abundance to merit such analysis. Where possible, however, faunal analysts identified and recorded the age of any faunal specimen. The criteria we used for aging deer bone were derived from prior studies by Severinghaus (1949), Robinette et al. (1957), and Lewall and Cowan (1963), particularly epiphyseal fusion rates.

Fewer than 50 specimens in the entire testing assemblage could be aged, and most of these come from a few unit levels at 45-OK-11. Recognizing this limitation, it is still worthwhile to note that the overwhelming majority of specimens come from animals older than 14 months of age.

Butchering Patterns

Archaeofaunal remains often are examined for evidence of butchering techniques. Typically, two types of indicators are used in such studies -- butchering marks and the kinds of bone fragments in the assemblage -- and we used both in our studies. The underlying assumption of this type of analysis is that ways and places in which bones are broken and the locations and orientations of butchering marks reflect techniques used by aboriginal peoples to process animal remains.

Butchering marks are defined as artificial features occurring on bone as a consequence of the butchering process. Generally, two types of marks are recognized: striae and scars. Striae are linear scratches that result from the removal of parent bone material by friction induced from the motion of a tool against a bone. The occurrence of such marks is taken to be indicative of a cutting process aimed at skinning or disarticulating a carcass or at deboning meat.

Table 6.2
Number of Identifiable Specimens (NISP) for Fauna Recovered from Tested Sites

Scientific Name	Common Name	NISP
PELECYPODA		
Margaritifera falcata	River mussel	20,123
Gonidea angulata	River mussel	29
PICES		
Salmonidae	Salmonid	78
Non-salmonidae	Non-salmonids	9
Indeterminate	Indeterminate	50
AMPHIBIA		
Bufo boreas	Western toad	1
REPTILIA		
Chrysemys picta	Painted turtle	40
Crotalus viridis	Northern Pacific rattlesnake	1
Indeterminate	Indeterminate	9
AVES		
Indeterminate	Indeterminate	1
MAMMALIA		
Large Herbivores		
Odocoileus sp.	Deer	374
Cervus elaphus	Elk	12
Antilocapra americana	Antelope	20
Ovis canadensis	Mountain/bighorn sheep	30
Ovis aries	Domestic sheep	1
Bison bison	Bison	18
Bos sp.	Cow	2
Indeterminate	Indeterminate	1,233
Small Herbivores		
Lepus sp.	Jackrabbit	6
Sylvilagus nuttallii	Nuttall cottontail	6
Marmota flaviventris	Yellow-bellied marmot	57
Castor canadensis	Beaver	6
Ondatra zibethica	Muskrat	1
Indeterminate	Indeterminate	3
Carnivores		
Canis sp.	Coyote/Wolf/Dog	5
Taxidea taxus	Badger	1
Felis concolor	Mountain lion	4
Lynx sp.	Bobcat/Lynx	1
Martes americana	Marten	1
Indeterminate	Indeterminate	3
Non-economic Rodents		
Peromyscus maniculatus	Deer mouse	2
Thomomys talpoides	Northern pocket gopher	207
Citellus sp.	Squirrel	7
Perognathus parvus	Great Basin pocket mouse	53
Eutamias sp.	Chipmunk	2
Neotoma cinerea	Bushy-tailed woodrat	1
Lagurus curtatus	Sagebrush vole	3
Microtus sp.	Vole	10
Indeterminate	Indeterminate	8
TOTAL		22,418

Scars, on the other hand, result from the impact of an implement against a bone, and two further subcategories -- chopping scars and flake scars -- commonly are recognized. Chopping scars appear where bone material has been pushed away or even completely broken away along the axis of impact. These scars are caused by sharp cutting implements such as a cleaver. Flake scars result from smashing a bone with a rock or other hard, dull implement. Such scars are morphologically similar to lithic flake scars and, most important, are distinct from chopping scars.

Where available, faunal analysts identified and recorded information that might be useful for reconstructing butchering patterns; however, only deer or deer-size bone were used. The cumulative data, although by no means necessarily representative of all variability in the reservoir, allow us to construct a hypothetical butchering model that may serve as a baseline from which to guide future studies at the project. With access to larger, more-controlled site samples, researchers may be able to identify geographic or temporal differences that may signify changing patterns of predation.

Information about the type and size of bone fragments in the assemblage provides further details regarding prehistoric butchering patterns. For example, the ascending ramus of the mandible often is broken to permit ready access to the tongue by removing the horizontal ramus. On occasion, either or both the articular and coronoid processes are broken off. In general, however, the horizontal and vertical ramii are separated.

Scapulae always are broken. This probably is a result of the disarticulartion process; the glenoid fossa with various portions of the blade attached is a common fragment in the assemblage. Long bones, which include the humerus, radius-ulna, femur, and tibia, tend to be broken comparably; proximal and distal ends and shaft fragments of various types and sizes are recorded. Apparently, carcasses were disarticulated by breaking out joints — an articulated proximal or distal end -- and shafts then were shattered for marrow extraction (cf., Lyman 1976b, 1978).

Although only a few pelvic fragments occur, they suggest that the ilium and perhaps the sacrum were separated from the acetabulum, pubis, and ischium. Disarticulation of the femur occasionally may have resulted in fragmentation of the acetabulum.

Metapodials occasionally were retained and brought to the site; their shafts were shattered for marrow extraction. The numbers of tarsals, carpals, and phalanges roughly coincide with the anatomical relative frequencies of these elements, suggesting that complete feet were brought back to floodplain sites from kill sites. First and second phalanges nearly always are broken, probably for their marrow. Second and third phalanges are relatively underrepresented. This may be the result of removing and leaving these elements at the kill site or using them for rattles, as described ethnographically (Ray 1932; Spier 1938).

Rib fragments suggest that the rib cage was broken away from the vertebral column, leaving rib heads attached to the vertebrae. Because few rib heads or vertebrae occur in the assemblage, it appears that vertebral columns largely were left at the kill site.

Mandible fragments and lower teeth are more than three times more abundant than skull fragments or upper teeth, suggesting that skulls also commonly were left at kill sites; perhaps the brain was extracted from the cranium at the kill site and brought back to camp. Mandibles may have been retained for marrow extraction. Antlers commonly were removed and used to make tools.

Lithics

The final major material component of the testing assemblage consists of stone (lithic) objects that either are modified for use as tools or ornaments or are the byproducts of such processes. We used three different types of classifications to characterize variability among these remains: technological, functional, and stylistic (historical). As noted previously, we also included worn or manufactured items of bone and shell as part of functional and stylistic considerations.

Technological Analysis

Technological analysis is an attempt to categorize an assemblage of artifacts into constituent parts that have meaningful correlates with manufacturing stages used to produce the multitude of implements people use for domestic and nondomestic activities. Although this need not be restricted to a single category of raw material (e.g., stone, bone, shell, wood), lithic manufacturing traditionally is by far the most common focus of such analyses. Two factors likely are most responsible for this: 1) lithic

manufacture is a subtractive technology that generates large numbers of intermediate products (detritus) during production of desired objects; and 2) lithic materials are highly resistant to degradation from natural environmental processes, and, consequently, we expect manufacturing detritus to occur in the archaeological record in amounts representative of the cultural processes that produced it.

During the past several decades, a considerable amount of experimental research has been devoted to lithic technology and to identification of stages in the manufacture of stone tools (e.g., Pond 1930; Ellis 1965; Sharrock 1966; Crabtree 1967b, 1972; Muto 1971; Newcomer 1971; Speth 1972; Knudson 1973; Swanson 1975; Smith and Goodyear 1976; Stafford 1979). Although specific details of lithic reduction sequences vary from one researcher to the next, most workers in the field are in general agreement about the processual staging of stone tool manufacture. Experimental findings (particularly Pond 1930; Muto 1971; Knudson 1973; Stafford 1979) can be used to generate a series of physical expectations that have identifiable realizations in the archaeological record. For example, researchers agree that it is possible to distinguish between pressure flaking and hard-hammer (e.g., stone) and soft-hammer (e.g., wood, antler) percussion flaking (Ellis 1965; Crabtree 1967b, 1972; Muto 1971; Newcomer 1971; Smith and Goodyear 1976; Stafford 1979), and much evidence exists to suggest that debitage from hard and soft-hammer percussion may be diagnostic of specific manufacturing stages (Crabtree 1967b; Muto 1971).

In addition to variability in morphological characteristics that can be used to identify particular manufacturing processes, certain chemical properties can be of considerable importance for technological characterizations. Obviously, the type of material used in various manufacturing sequences is dependent upon such factors as availability, workability, and desirability for ultimate use in specific activities (Crabtree 1967a). Because attributes of the outputs of the various reduction stages will vary with differing material types, this dimension of variability should be included in the classificatory scheme. Material type also is vitally important in analyzing resource procurement patterns.

In a similar vein, heat treatment is known to improve the elasticity of siliceous materials, allowing the artisan greater control of flake removal (Crabtree and Butler 1964; Flenniken and Garrison 1975; Purdy 1974). Ray (1932:90) mentions that projectile points sometimes were buried beneath a hearth before a hunt. Consequently, we considered this aspect of lithic technology during our analysis of the testing assemblage.

The technological analysis system we developed for the Chief Joseph Dam Cultural Resources Survey Project is intended to provide basic data useful for making the kinds of distinctions described above. We recognized five basic classificatory dimensions: type of object, raw material, condition of object, amount of cortex, and treatment of material. In addition, we measured several quantitative attribute states, including the length, width, thickness, and weight of each specimen. The following is a list of the dimensions and their recognized attributes that analysts used to classify and quantify each lithic specimen or worn/manufactured bone or shell artifact -- the number next to each attribute state corresponds to the code value that analysts recorded onto our LITHAN computer forms.

DIMENSION I: TYPE OF OBJECT

1. Nontabular Flake
2. Chunk -- an object that exhibits breakage along natural cleavage planes but no evidence of flake scars
3. Core -- An object that exhibits one or more flake scars
4. Blade -- A parallel-sided flake whose length is at least twice its width
5. Unmodified Object -- An object that lacks evidence of purposeful modification
6. Tabular Flake -- A flake that exhibits parallel dorsal and ventral surfaces indicative of separation along natural bedding planes
7. Formed Object -- An object that exhibits evidence of purposeful modification to produce a pre-determined form
9. Indeterminate

DIMENSION II: RAW MATERIAL

1. Jasper
2. Chalcedony
3. Coarse-grained quartzite
4. Fine-grained quartzite
5. Coarse-grained basalt
6. Granite
7. Fine-grained basalt
8. Petrified wood
9 Obsidian
10. Bone/antler
11. Ochre
12. Shell
13. Textile
14. Sandstone
15. Nephrite
16. Siltstone/mudstone
17. Pumice/volcanic material
18. Steatite
19. Mica
20. Silicized mudstone
21. Schist
22. Calcite
23. Shale
24. Porphrytic volcanic
25. Porphrytic microdiorite
26. Fossilized bark
27. Wood
28. Quartz
29. Felsite
30. Argillite
31. Gneiss
32. Diorite
33. Feldspar
34. Dentalium (shell)
35. Graphite/molybdenite
99. Indeterminate

DIMENSION III: CONDITION

1. Complete
2. Proximal fragment
3. Proximal fragment - squared distal end
4. Distal fragment
9. Indeterminate

DIMENSION IV: AMOUNT OF CORTEX

1. No cortex (cortex < 5%)
2. Partial cortex (cortex = 5 - 79%)
3. Complete cortex (cortex >79%)
4. Indeterminate/not applicable

DIMENSION V: TREATMENT OF MATERIAL

1. Burned -- spalled, crazed, or blackened
2. Dehydrated -- possibly heat-treated
9. No evidence/not applicable

ATTRIBUTE I: WEIGHT

Weight of object measured in tenths of grams.

ATTRIBUTE II: LENGTH

Flakes -- length is measured between the point of impact and the distal end along the bulbar axis.

Other objects -- length is taken as the longest dimension.

ATTRIBUTE III: WIDTH

Flakes -- width is measured at the widest point perpendicular to the bulbar axis.

Other objects -- width is taken as the broadest point along an axis perpendicular to the long axis of the object.

ATTRIBUTE IV: THICKNESS

Flakes -- thickness is measured at the thickest point on the object, excluding the bulb of percussion and striking platform.

Other objects -- thickness is taken as the thickest point along an axis orthogonal to both the axes used to characterize length and width.

In developing this system, we made a conscious decision to err on the side of overdifferentiation; sufficient time was not available during analysis to afford us an advance opportunity to test all classificatory distinctions for cultural meaning. Consequently, some of the attributes recognized above likely are of little or no interpretive value. In order to establish the minimum number of distinctions useful for subsequent analyses of intersite formal, temporal, and geographic variability, I first examine assemblage-wide characteristics. Where our initial classification fails to yield distinctions potentially useful for subsequent analyses, we either eliminate an entire dimension or reconfigure its attributes.

Table 6.3 enumerates the numbers and frequencies of raw materials in the assemblage. As a group, cryptocrystalline silicas (e.g., jasper, chalcedony, petrified wood) constitute nearly 80 percent of all objects. As was the case at Kettle Falls (Chance et al. 1977; Chance and Chance 1977, 1979), both quartzite (fine and coarse-grained) and argillite occur in significant quantities, together comprising over 18 percent of all classfied objects; however, fine-grained

Table 6.3
Frequency of Artifact Raw Materials

Material	Number	Frequency (%)
Jasper	8,461	62.9
Chalcedony	1,985	14.8
Coarse-grained quartzite	1,975	14.7
Fine-grained quartzite	98	0.7
Coarse-grained basalt	145	1.0
Granite	128	0.9
Fine-grained basalt	49	0.3
Petrified wood	52	0.4
Obsidian	21	0.2
Bone/antler	16	0.1
Ochre	1	<0.1
Sandstone	9	0.1
Nephrite	1	<0.1
Siltstone	8	0.1
Silicized mudstone	43	0.3
Schist	7	0.1
Porphrytic volcanic	8	0.1
Quartz	14	0.1
Argillite	368	2.7
Gneiss	2	<0.1
Feldspar	7	0.1
Dentalium	1	<0.1
Graphite	1	<0.1
Indeterminate	55	0.4
Total	13,455	100.0

quartzite occurs so rarely that we decided to combine it with its coarse-grained variant for the purposes of subsequent analyses. Although fire-modified rock predominantly are basalt, this material is only a minor component of the technological assemblage. Because fine-grained basalt is relatively rare, we combine it with the coarse-grained variety. Obsidian too occurs infrequently; however, even in small amounts, this category may have interpretive importance because it does not occur naturally in the region and had to be obtained through either long-distance travel or trade. Numerous other sedimentary, igneous, and metamorphic materials also occur, but no one of these comprises more than 1 percent of the total assemblage. Consequently, we combine all remaining material types into a single category -- *other* -- in follow-on analyses.

Table 6.4 lists the numbers and frequencies of object types according to the restricted set of raw materials types identified above. Even a cursory examination of this table yields several interesting results. At the most general level, the frequencies of the various object type classes indicate that relatively few cores or unmodified objects occur and that flakes of one kind or another (tabular, nontabular, blades) dominate the assemblage. This suggests that tools largely were manufactured away from the floodplain and that most detritus is the result of tool reshaping and resharpening. Although most formed objects are fashioned from cryptocrystallines, all unmodified objects are noncryptocrystalline.

Table 6.4
Lithic Raw Material versus Object Type

Material	Nontabular Flake	Chunk	Core	Blade	Unmodified Object	Tabular Flake	Formed Object	Total
Jasper	7,246	713	33	73	0	0	354	8,415
	86.0[a]	*8.5*	*0.4*	*0.9*	*0.0*	*0.0*	*4.2*	
	74.4[b]	*76.2*	*62.3*	*46.2*	*0.0*	*0.0*	*60.9*	
Chalcedony	1,715	82	12	79	0	0	95	1,983
	86.5	*4.1*	*0.6*	*4.0*	*0.0*	*0.0*	*4.8*	
	17.6	*8.8*	*22.6*	*50.0*	*0.0*	*0.0*	*16.4*	
Quartzites	224	67	3	3	8	1,704	57	2,066
	10.8	*3.2*	*0.1*	*0.1*	*0.4*	*82.5*	*2.8*	
	2.3	*7.2*	*5.7*	*1.9*	*6.7*	*98.8*	*9.8*	
Basalts	98	17	0	1	38	0	25	179
	54.7	*9.5*	*0.0*	*0.6*	*21.2*	*0.0*	*14.0*	
	1.0	*1.8*	*0.0*	*0.6*	*31.9*	*0.0*	*4.3*	
Petrified wood	36	9	0	1	0	1	5	52
	69.2	*17.3*	*0.0*	*1.9*	*0.0*	*1.9*	*9.6*	
	0.4	*1.0*	*0.0*	*0.6*	*0.0*	*<0.1*	*0.9*	
Obsidian	14	1	0	1	0	0	4	20
	70.0	*5.0*	*0.0*	*5.0*	*0.0*	*0.0*	*20.0*	
	0.1	*0.1*	*0.0*	*0.6*	*0.0*	*0.0*	*0.7*	
Argillite	347	7	0	0	0	0	11	
	95.0	*1.9*	*0.0*	*0.0*	*0.0*	*0.0*	*3.0*	
	3.6	*0.7*	*0.0*	*0.0*	*0.0*	*0.0*	*1.9*	
Other	53	40	5	0	73	20	30	221
	24.0	*18.1*	*2.3*	*0.0*	*33.0*	*9.0*	*13.6*	
	0.5	*4.3*	*9.4*	*0.0*	*61.3*	*1.1*	*5.2*	
Total	9,729	936	53	158	119	1,725	581	13,301

[a] Row percentages
[b] Column percentages

Several material categories, including obsidian, basalt, petrified wood, and other, contain disproportionately high frequencies of formed objects in comparison to the assemblage as a whole. In the case of both obsidian and petrified wood, the reason for this may be that neither material naturally occurs in the region and had to be obtained by trade or long-distance travel; the nearest source of obsidian is in eastern Oregon, and the nearest source of petrified wood is the Vantage area of the mid-Columbia River region. Consequently, we should expect that most specimens were transported to the region in finished form or as chunks or prepared cores that easily could be fashioned into formed objects. Thus, most of the debitage from these two materials probably is the result of tool resharpening or the final stages of the lithic manufacturing process. The relatively high frequencies of formed objects of basalt and "other" cannot be ascribed to the absence of locally available sources; these materials occur in abundance along the river. Instead, the reason

may be the nature of manufacturing processes used to fashion tools from these materials. Most formed objects in the assemblage were created by either crushing and grinding specimens into a desired shape (e.g., a pestle) or removing a few relatively large primary and secondary flakes from the lateral margins of a cobble (e.g., a cobble chopper), and neither process results in abundant detritus.

Further information about lithic technology is available from an examination of the decortication process. Of the 13,438 lithic specimens in the inventory, 11,616 (86.4%) have no cortex, 909 (6.8%) exhibit partial cortex, and 211 (1.6%) display relatively compete cortical surfaces. This frequency distribution reinforces our previous conclusion that most primary reduction took place away from sites along the river. With the exception of cryptocrystallines, most raw materials occur in locally available beach deposits and glacial tills, and initial decortication probably took place in situ on an encounter basis. Cryptocrystalline materials useful for stone tool manufacture rarely appear in beach or till deposits; however, sources do occur in vesicular basalts along the Douglas County rim of the escarpment. Consequently, it seems reasonable to conclude that these materials were quarried from sources away from the reservoir, initially shaped, and then transported down to floodplain sites for final shaping.

Tables 6.5 and 6.6 cross-tabulate material type and amount of cortex for complete flakes and cores and chunks in the testing assemblage; obsidian is not included because all specimens of this material are broken. These data provide additional clues about the lithic reduction processes used by the region's prehistoric inhabitants.

The frequencies of cortex displayed on jasper, chalcedony, petrified wood, and argillite objects are quite similar and differ significantly from other material types, further supporting our earlier contention that most primary reduction of cryptocrystalline materials took place away from the river; less than 1 percent of these specimens exhibit cortex. On the other hand, more than half of the basalt, quartzite, and "other" objects in the assemblage display cortex, which suggests that primary reduction of these materials occurred locally. Taken together with the high frequency of formed objects, it seems likely that most onsite manufacturing of basalt, quartzite, and "other" materials was directed towards production of large core tools requiring the removal of relatively few flakes to produce a serviceable implement. This conclusion also is supported by size data; overall, objects of these materials are more than twice as large in all dimensions as their jasper, chalcedony, petrified wood, and argillite counterparts. The single major exception to this pattern is the size of flakes exhibiting no cortex. The sizes of these flakes for all material types are remarkably alike, and relatively small, suggesting that they largely are the result of the final (tertiary) stage of tool manufacture.

Although analysts attempted to identify evidence of heat treatment in the assemblage, this proved difficult. Of the nearly 13,500 specimens we examined, less than 4 percent exhibit any attributes suggesting heat-induced modification. Most of these, however, are spalled, crazed, or blackened, which are more indicative of unintentional burning. Approximately 1 percent of the assemblage (126 objects) exhibits a "greasy" luster that might be the result of intentional heat treatment. A large proportion of these, however, probably are hydrated opal, a raw material type that naturally exhibits a greasy luster with long-term exposure to air. Unfortunately, we did not recognize opal as occurring in the testing assemblage, and analysts classifed all these specimens as jasper.

Although the technological patterns noted above likely are indicative of many of the general processes employed by the area's pehistoric inhabitants for lithic tool production, several of the distinctions I've cited for the assemblage as a whole may be of little or no value for site-specific analyses. For example, amount of cortex exhibits so little variability -- the overwhelming majority of all specimens lack any cortex -- that no useful purpose would be served by using this classificatory dimension. Consequently, all further treatment of technological variability is limited to analyses of differences in material and object types.

Functional Analysis

Functional analysis concerns alterations that objects exhibit as a consequence of their use. Although such use-wear primarily occurs on stone and bone objects, artifacts of other material types also may exhibit this type of modification.

During the past two decades, an impressive body of literature has developed concerning the analysis of edge damage/attrition on lithic artifacts (Sonnefeld 1962; Frison 1968;

Table 6.5
Mean Length, Width, and Thickness of Flakes for Major Lithic Material Types versus Amount of Cortex

Material Type	Attribute[1]	Dorsal Cortex				Total
		None	Partial	Complete	Ind./NA[2]	
Jasper	n	1,959	16	0	126	2,101
	%	93.2	0.8	0.0	6.0	*67.8*[a]
	L	11.9	19.2	—	16.3	12.2
	W	11.6	18.7	—	18.0	12.0
	T	2.4	4.0	—	4.4	2.5
Chalcedony	n	592	2	0	26	620
	%	95.5	0.3	0.0	4.2	*20.0*
	L	11.3	18.5	—	12.0	11.3
	W	10.6	13.5	—	14.6	10.8
	T	2.0	4.5	—	3.2	2.1
Quartzite	n	106	86	11	3	206
	%	51.5	41.7	5.3	1.5	*6.6*
	L	14.5	33.8	67.7	13.6	25.4
	W	15.0	32.9	63.4	14.7	25.0
	T	2.8	7.8	12.7	2.7	5.4
Basalt	n	15	20	2	2	39
	%	38.5	51.3	5.1	5.1	*1.3*
	L	16.6	39.1	30.5	17.5	28.9
	W	19.2	42.0	45.0	33.0	32.9
	T	3.6	11.1	6.6	3.8	7.6
Petrified Wood	n	14	2	0	0	16
	%	87.5	12.5	0.0	0.0	*0.5*
	L	12.6	12.0	—	—	12.5
	W	12.6	18.5	—	—	13.4
	T	2.2	3.5	—	—	2.4
Argillite	n	68	1	0	4	73
	%	93.2	1.4	0.0	5.5	*2.5*
	L	11.5	10.0	—	15.0	11.7
	W	12.7	9.0	—	24.2	13.3
	T	1.9	1.4	—	4.0	2.0
Other	n	20	18	4	3	45
	%	44.4	40.0	8.9	6.7	*1.5*
	L	17.1	42.2	90.2	42.0	35.3
	W	20.2	42.5	68.5	55.0	35.7
	T	4.4	9.2	24.5	13.1	8.7
Total	n	2,744	145	17	164	3,100
	%	89.5	4.7	0.5	5.3	—
	L	11.9	33.3	68.6	16.0	13.4
	W	11.7	33.1	62.4	18.4	13.3
	T	2.3	7.9	14.8	4.3	2.7

[1] n = number of specimens; % = row percentage; L = mean length (mm); W = mean width (mm); T = mean thickness (mm)
[2] Indeterminate/Not applicable
[a] Italics = Column percentage

Table 6.6
Mean Length, Width, and Thickness of Chunks and Cores for Major Lithic Material Types versus Amount of Cortex

Material Type	Attribute[1]	Dorsal Cortex None	Partial	Complete	Ind./NA[2]	Total
Jasper	n	618	9	1	115	743
	%	83.2	1.2	0.1	15.5	*73.5*[a]
	L	16.0	25.5	10.0	18.5	16.6
	W	11.2	19.8	10.0	13.4	11.7
	T	5.5	8.6	2.7	7.3	5.8
Chalcedony	n	69	1	0	22	92
	%	75.0	1.1	0.0	23.9	*9.1*
	T	15.8	26.0	—	19.2	16.8
	W	9.9	12.0	—	13.3	10.8
	T	5.5	9.3	—	8.7	6.3
Quartzite	n	30	49	2	1	82
	%	36.6	59.8	2.4	1.2	*8.1*
	L	26.3	41.3	77.0	19.0	36.5
	W	17.5	28.6	58.0	12.0	25.1
	T	9.1	15.7	35.2	8.2	13.7
Basalt	n	8	9	1	2	20
	%	40.0	45.0	5.0	10.0	*2.0*
	L	48.5	84.0	180.0	117.0	77.9
	W	39.5	69.0	160.0	59.5	60.8
	T	8.6	36.4	128.0	18.4	28.1
Petrified Wood	n	5	1	0	3	9
	%	55.6	11.1	0.0	33.3	*0.9*
	L	21.8	31.0	—	33.3	26.7
	W	16.0	11.0	—	15.3	15.2
	T	7.0	34.	—	7.2	6.6
Argillite	n	3	1	0	3	7
	%	42.9	14.3	0.0	42.9	*0.7*
	L	13.3	15.0	—	31.0	21.1
	W	10.0	12.0	—	21.0	15.0
	T	5.6	6.5	—	7.6	6.6
Other	n	23	16	1	18	58
	%	39.7	27.6	1.7	31.0	*5.7*
	L	33.7	73.3	148.0	40.2	48.7
	W	20.0	52.1	94.0	20.2	30.2
	T	9.5	31.2	55.4	7.3	15.6
Total	n	756	86	5	164	1,011
	%	74.8	8.5	0.5	16.2	—
	L	17.3	49.5	98.4	22.7	21.3
	W	11.9	35.7	76.0	14.9	14.7
	T	5.8	19.7	51.3	7.6	7.5

[1] n = number of specimens; % = row percentage; L = mean length (mm); W = mean width (mm); T = mean thickness (mm)
[2] Indeterminate/Non applicable
[a] Italics = Column percentage

Wylie 1975; Odell 1977; Stafford 1979). Recognizing the interpretive potential of attributing specific attribute patterns to tool motion (e.g., cutting, scraping) on particular media (e.g., bone, flesh, wood), a considerable number of experimental studies have been directed toward inferring specific tool function solely on the basis of wear characteristics (Sonnenfeld 1962; Semenov 1964; Keller 1966; Witthoft 1967; Faulkner 1972; Crabtree 1973; Keeley 1974, 1978; Tringham et al. 1974; Wylie 1975; Keeley and Newcomer 1977; Odell 1977; Hayden 1979; Lawrence 1979; Newcomer and Keeley 1979; Stafford 1979). Much of this experimental data strongly supports a wear pattern - tool function correlation.

Of considerable interest are the studies on microwear, particularly polishes, completed by Keeley (1978), Keeley and Newcomer (1977), and Newcomer and Keeley (1979). These works suggest that it is possible to identify correctly varying modes of tool use, as well as to specify the medium on which a tool was used. Specifically, they found that diagnostic polishes appear on tool edges or surfaces as a consequence of their use on materials such as bone, wood, and gristle. These wear landmarks are identifiable microscopically at powers in excess of 200X. An examination of all tools at such high magnifications is not feasible with large lithic assemblages, however, and, more important, may not even be necessary. Stafford and Stafford (1979) and Holley (1979) report on experiments in which macroscopic and microscopic wear identifications were undertaken on identical assemblages. They conclude that no appreciable information gain results from increased microscopic magnification. This, in turn, suggests that for many kinds of functional analyses, macroscopic wear characterizations are adequate for inferring cultural activity.

Our analyses of assemblage functional variability involved two major steps. First, analysts separated all lithic specimens exhibiting evidence of wear or manufacture from unworn objects and catalogued them along with any worn or manufactured items of bone and shell. Following this initial sorting stage, analysts categorized each area of use on an artifact according to our classificatory scheme and recorded relevant attributes onto functional analysis (FUNCAN) forms.

We used five separate classificatory dimensions to specify functional variability in the testing assemblage: kind of wear, location of wear, shape of worn area, edge angle, and orientation of wear. The following is a list of the attributes for each of these dimensions.

DIMENSION I: KIND OF WEAR

1. Chipping -- Small conchoidal fragments have been removed from an edge leaving a series of flake scars

2. Abrasion -- The worn edge, point, or surface displays striations, with or without gloss

3. Crushing -- Irregular fragments have been removed, leaving a pitted worn area

4. Polishing -- The edge, point, or surface exhibits a gloss that cannot be resolved into striations

5. None -- No wear is evident

DIMENSION II: LOCATION OF WEAR

1. Edge -- Wear occurs only at a single edge formed by the intersection of two planes; the wear does not visibly extend onto either surface

2. Unifacial Edge -- Wear occurs on an edge formed by the intersection of two planes and extends onto one of the surfaces forming that edge

3. Bifacial Edge -- Wear occurs on an edge formed by the intersection of two planes and extends onto both surfaces forming that edge

4. Point -- Wear occurs only at the intersection of three or more planes

5. Point and Unifacial Edge

6. Point and Bifacial Edge

7. Point and Two Edges

8. Surface -- Wear occurs on a single plane and does not extend to any edge

9. None -- No wear is evident

DIMENSION III: SHAPE OF WORN AREA

1. Convex -- The worn area forms an arc with a curve away from a flat surface; a tangent to the arc intersects it in only one place

2. Concave -- The worn area forms an arc with a curve toward a flat surface; a tangent to the arc intersects it at its two endpoints

3. Straight -- Neither the edge nor the surface of the worn area displays a discernible arc

4. Point -- The worn area forms an abrupt convexity

5. Notch -- The worn area forms an abrupt concavity

6. None -- No wear is evident

DIMENSION IV: EDGE ANGLE

1. Low -- <30°
2. Medium -- 30° to 60°
3. High -- >60°
4. None -- No wear is evident, or the wear is not on an edge

DIMENSION V: ORIENTATION OF WEAR

1. Parallel -- The wear axis fails to intersect an edge or intersects an edge or surface at an angle of less than 30°.

2. Oblique -- The wear axis intersects an edge or surface at an angle greater than 30° but less than 60°

3. Perpendicular -- The wear axis intersects an edge or surface at an angle greater than 60° but less than 90°

4. Diffuse -- The wear shows no evident direction(s)

5. Linear -- The wear is unidirectional on a surface

6. None -- No wear is evident

Table 6.7 enumerates the numbers and frequencies of functional classes occurring in the assemblage. As can be seen from this tabulation, most classes contain few members; only 14 of the 76 classes represented have 10 or more members. Nevertheless, the data do permit us to draw several conclusions about the general nature of functional variability in the testing assemblage as a whole.

Before discussing specific classes and their frequencies of occurrence, it shoud be noted that sets of classes may be referred to by specifying only certain dimensions and attributes of those dimensions. For example, all classes relating to wear on a bifacial edge, regardless of kind of wear, shape of worn area, edge angle, or orientation of wear, are termed the *02000* tool series. Similarly, all classes displaying linear abrasion, regardless of other attributes, belong to the *20005* series. In this notation system, we simply use zeros to keep track of the classficatory dimensions not under consideration. The notation also may be extended to include two or more attributes of a dimension. For example, the set of classes comprising wear on an edge or unifacial edge is the union of the two tool class series *01000* and *02000*, and notationally, I refer to this series union as $0[1 \cup 2]000$.

Most tools exhibit chipping wear of one kind or another; the series *10000* comprises 71 percent of the entire testing assemblage. A majority of these (n = 827) belong to the series $1[1 \cup 2]000$, which includes all chipping wear on an edge or unifacial edge and accounts for more than 65 percent of all tools. Two classes in this series, *12113* and *12123*, together make up one-third (33.2%) of all tools. Unifacial chipping wear on a convex edge of low or medium angle probably results most often from cutting of relatively soft materials (e.g., animal tissue), and tools of these classes likely would be classified as "knives" in more traditional functional nomenclatures. Unifacial chipping wear on a steep, convex edge *(12133)*, tools traditionally referred to as "scrapers", constitutes 8.7 percent of the assemblage.

The three classes representing unifacial chipping wear on a concave edge $(122[1 \cup 2 \cup 3]3)$ together account for 17.5 percent of all tools. Such tools likely were used to cut or scrape items of wood, bone, and sinew. In traditional terms, these objects would be called "concave knives" or "spokeshaves", depending upon the depth of the concavity; the steep-angled type *(12233)* most likely results from scraping.

Although bifacial wear also could result from cutting or scraping activities, this series *(03000)* is poorly represented in the testing assemblage, comprising only 2 percent of all tools. Most bifacial edges appear to be the result of purposeful manufacture, perhaps to strengthen the edge for heavy-duty cutting, sawing, or chopping operations; however, it is nearly impossible to distinguish wear from manufacture in such circumstances.

Table 6.7
Functional Class Representation

Class Code	Class Definition	Number	%
11123	Perpendicular chipping on a convex edge of medium angle	2	0.2
11133	Perpendicular chipping on a convex edge of steep angle	4	0.3
11223	Perpendicular chipping on a concave edge of medium angle	1	0.1
11233	Perpendicular chipping on a concave edge of steep angle	1	0.1
11523	Perpendicular chipping on a notched edge of medium angle	1	0.1
12112	Oblique unifacial chipping on a convex edge of low angle	1	0.1
12113	Perpendicular unifacial chipping on a convex edge of low angle	273	21.5
12123	Perpendicular unifacial chipping on a convex edge of medium angle	149	11.7
12132	Oblique unifacial chipping on a convex edge of steep angle	1	0.1
12133	Perpendicular unifacial chipping on a convex edge of steep angle	110	8.7
12213	Perpendicular unifacial chipping on a concave edge of low angle	126	9.9
12223	Perpendicular unifacial chipping on a concave edge of medium angle	58	4.6
12233	Perpendicular unifacial chpping on a concave edge of steep angle	39	3.1
12313	Perpendicular unifacial chipping on a straight edge of low angle	29	2.3
12323	Perpendicular unifacial chipping on a straight edge of medium angle	20	1.6
12333	Perpendicular unifacial chipping on a straight edge of steep angle	10	0.8
12513	Perpendicular unifacial chipping on a notched edge of low angle	1	0.1
12523	Perpendicular unifacial chipping on a notched edge of medium angle	1	0.1
13113	Perpendicular bifacial chipping on a convex edge of low angle	8	0.6
13123	Perpendicular bifacial chipping on a convex edge of medium angle	7	0.6
13133	Perpendicular bifacial chipping on a convex edge of steep angle	4	0.3
13213	Perpendicular bifacial chipping on a concave edge of low angle	4	0.3
13223	Perpendicular bifacial chipping on a concave edge of medium angle	3	0.2
14413	Perpendicular chipping on a point of abrupt convexity of low angle	5	0.4
14423	Perpendicular chipping on a point of abrupt convexity of medium angle	1	0.1
14443	Perpendicular chipping on a point of abrupt convexity; no edge angle	5	0.4
15123	Perpendicular chipping on a point and unifacial convex edge of medium angle	2	0.2
15213	Perpendicular chipping on a point and unifacial concave edge of low angle	1	0.1
15313	Perpendicular chipping on a point and unifacial straight edge of low angle	1	0.1
15413	Perpendicular chipping on a point and unifacial abrupt convex edge of low angle	7	0.6
15433	Perpendicular chipping on a point and unifacial abrupt convex edge of steep angle	1	0.1
16323	Perpendicular chipping on a point and bifacial straight edge of medium angle	1	0.1
17113	Perpendicular chipping on a point and two convex edges of low angle	1	0.1
17413	Perpendicular chipping on a point and two abrupt convex edges of low angle	1	0.1
17422	Oblique chipping on a point and two abrupt convex edges of medium angle	5	0.4
17423	Perpendicular chipping on a point and two abrupt convex edges of medium angle	6	0.5
17432	Oblique chipping on a point and two abrupt convex edges of steep angle	5	0.4
17433	Perpendicular chipping on a point and two abrupt convex edges of steep angle	8	0.6

Table 6.7 (continued)

Class Code	Class Definition	Number	%
21111	Parallel abrasion on a convex edge of low angle	75	5.9
21113	Perpendicular abrasion on a convex edge of medium angle	1	0.1
21121	Parallel abrasion on a convex edge of medium angle	72	5.7
21123	Perpendicular abrasion on a convex edge of medium angle	2	0.2
21131	Parallel abrasion on a convex edge of steep angle	49	3.9
21133	Perpendicular abrasion on a convex edge of steep angle	6	0.5
21211	Parallel abrasion on a concave edge of low angle	11	0.9
21221	Parallel abrasion on a concave edge of medium angle	8	0.6
21231	Parallel abrasion on a concave edge of steep angle	6	0.5
21311	Parallel abrasion on a straight edge of low angle	5	0.4
21321	Parallel abrasion on a straight edge of medium angle	3	0.2
21331	Parallel abrasion on a straight edge of steep angle	1	0.1
21333	Perpendicular abrasion on a straight edge of steep angle	2	0.2
22113	Perpendicular unifacial abrasion on a convex edge of low angle	2	0.2
22133	Perpendicular unifacial abrasion on a convex edge of steep angle	1	0.1
22213	Perpendicular unifacial abrasion on a concave edge of low angle	1	0.1
24411	Parallel abrasion on a point of abrupt convexity of low angle	1	0.1
24433	Perpendicular abrasion on a point of abrupt convexity of steep angle	1	0.1
24441	Perpendicular abrasion on a point of abrupt convexity, no edge angle	6	0.5
24446	Abrasion on an abrupt convexity, no edge angle	1	0.1
27433	Perpendicular abrasion on a point and two abrupt convex edges of steep angle	3	0.2
27446	Abrasion on a point of abrupt convexity, no edge angle	1	0.1
28141	Parallel abrasion on a convex surface	1	0.1
28144	Diffuse abrasion on a convex surface	3	0.2
28145	Linear abrasion on a convex surface	5	0.4
28146	Abrasion on a convex surface	1	0.1
28245	Linear abrasion on a concave surface	1	0.1
31123	Perpendicular crushing on a convex edge of medium angle	4	0.3
31133	Perpendicular crushing on a convex edge of steep angle	7	0.6
31143	Perpendicular crushing on a convex edge, no edge angle	2	0.2
31243	Perpendicular curshing on a concave edge, no edge angle	1	0.1
34443	Perpendicular crushing on a point of abrupt convexity; no edge angle	1	0.1
38141	Parallel crushing on a convex surface	2	0.2
38143	Perpendicular crushing on a convex surface	71	5.6
38243	Perpendicular crushing on a concave surface	6	0.5
38244	Diffuse crushing on a concave surface	2	0.2
38343	Perpendicular crushing on a straight surface	1	0.1
47441	Diffuse polish on a point and two abrupt convex edges; no edge angle	1	0.1
	TOTAL	1,271	—

Chipping wear on a point and adjacent edges generally is the result of activities such as picking, gouging, drilling, chiseling, and engraving. These operations are complex; several such activities may result in the same kind of wear, or the same tool could be used for several allied operations. Consequently, for the purposes of later analyses, I group all classes representing chipping wear involving a point into a single series *(1[4 ∪ 5 ∪ 6 ∪ 7]000)* that accounts for nearly 4 percent of all tools.

The abrasion wear series *(20000)* comprises 21.2 percent of the tool assemblage, 91.1 percent of which exhibit wear on an edge or unfacial edge *(2[1 ∪ 2]000)*. The overwhelming majority of these are fashioned of tabular quartzite and would be referred to in traditional terms as tabular quartzite knives or scrapers. The remaining tools exhibiting abrasion display wear on a point of abrupt convexity *(2[4 ∪ 5 ∪ 6 ∪ 7]000)*, which often are called manos or pestles, or wear on a surface *(28000)*, which includes grinding stones and abraders. Neither series, however, contains sufficient representatives to warrant more detailed discussion.

The crushing wear series *(30000)* incorporates all tools traditionally referred to as hammers, anvils, and mortars, where crushing wear results from pounding the tool on or being pounded by another hard object. The series constitutes 7.6 percent of all tools, and one class *(38143)* -- hopper mortar bases -- occurs in by far the greatest frequency. I must caution, however, that the relative frequencies of individual tool classes or even class series cannot be equated with the relative prevalence of different kinds of economic activities. This is because the effective use-lives of different functional classes may vary markedly. For example, the use-life of a hopper mortar base likely is considerably longer than that of a thin flake used for cutting. Consequently, although we may distinguish each as single tools, resultant tool class counts will be biased in favor of those classes having the shortest use-lives.

Only one tool exhibits evidence of polish *(40000)*. Although it is likely that other examples of this type of wear may occur in the testing assemblage, often it is difficult to distinguish macroscopically.

In addition to the 1,271 tools we were able to classify on the basis of observable wear patterns, 383 objects display evidence of purposeful shaping but no wear. Although many of these likely were used as tools, they are not considered here because of their lack of identifiable use modification.

Stylistic Analysis

The final stage of our laboratory processing and analysis program for discrete portable artifacts consisted of examining purposefully shaped artifacts to establish historic, or temporally sensitive, types. Although radiocarbon age determinations on organic samples taken from known cultural contexts were expected to provide absolute chronological assignments for many occupation components, we hoped to supplement these data with historical artifact classifications that could allow us to place additional occupation components in at least relative chronological order.

As a consequence of our initial artifact sorting efforts, laboratory processors identified nearly 600 specimens exhibiting evidence of purposeful shaping. In almost all instances, however, available shaped artifact classes occur in such low frequencies or lack sufficient formal variability that no useful purpose would be served by attempts to develop style-based distinctions among constituent members. Indeed, the only artifacts displaying the requisite criteria for stylistic analysis is the class of objects labeled "projectile points", which we define as wholly manufactured, pointed, bilaterally symmetrical objects that exhibit a means of hafting the implement onto a shaft at the end opposite the point. Consequently, our stylistic analyses are restricted to this single artifact category.

Projectile point styles in particular have been shown to be relatively sensitive temporal indicators elsewhere along the Columbia and Snake Rivers (Grabert 1968; Nelson 1969; Leonhardy and Rice 1970; Pettigrew 1974, 1975, 1976, 1977; Dunnell et al. 1976; Dunnell, Lewarch, and Campbell 1976; Chance et al. 1977; Chance and Chance 1977; Dunnell and Campbell 1977); Dunnell and Whitlam 1977. Our preliminary examinations of projectile points recovered form sites in the project area indicated definite similarities with styles reported by researchers in nearby reservoirs (Figure 4.2). When examined along with similar constructs proposed for more distant localities, such as the lower Snake River region (Leonhardy and Rice 1970), several major themes emerge in the development of point styles throughout the Plateau:

- Points tend to get smaller through time; this pattern may parallel the change in the type of implement to which the projectile was attached -- from spear to atlatl to arrow;

- The basic outline of the blade tends to change from lanceolate to ovate to triangular;

- Separate haft elements -- stems -- tend to appear through time; the sequence apparently runs from no separate haft element to shouldering to distinctly separate haft element;

- The shape of the stem tends to change through time from contracting to straight and/or expanding; and

- Notching tends to appear through time; more specifically, it tends to change from corner to side-notched varieties late in the sequence.

Although existing regional projectile point classifications provide considerable insight into historical morphological trends, we found several problems with these constructs. The classifications lack comparability with each other; each applies only to a limited geographic area. They lack unambiguous definitions that would allow other researchers to arrive at the same classificatory units. Finally, the historical significance of recognized regional point classes is not well-tested.

Our goal in investigating stylistic variability in projectile points recovered at the project was to develop a classificatory scheme that yields objective, unambiguous classes, or types, having demonstrable historic significance. To this end, several considerations are important in selecting methods for stylistic analysis of projectile points. First and foremost, we require a method that yields classes to which unambiguous definitions can be applied. We also desire a system that is as objective as possible; different researchers should be able to apply the classification to the same assemblages and get identical, or nearly identical, results. Because we view classifi-cations as dynamic, rather than static constructs, we want a system that will permit inclusion of assemblages from other areas of the Plateau without altering basic class constructs. Finally, the classificatory system should yield classes of demonstrable historical significance.

We felt that numerical taxonomy met the above criteria. Because we planned to perform numerical taxonomy with metric variables, we needed a means of rendering significant morphological variability into metrical attributes amenable to further manipulation. Further, we required, not just any set of metrics, but one that would bear identifiable, unambiguous relationships to the kinds of historical trends noted previously. Fortunately, several investigators in other parts of the country have been interested in morphometric transcription of projectile points (e.g., Gunn and Prewitt 1975; Thomas and Bettinger 1976; Benfer and Benfer 1981), and we built upon their experience to define a number of landmarks on the projectile points as well as measurements and indices that could be derived from these.

Before discussing how we applied numerical taxonomy to testing assemblage points, it is appropriate that we first consider what is entailed by this classificatory method. Numerical taxonomy is a term applied to a wide variety of techniques that can be used to subdivide a specified set of phenomena into two or more constituent groups on the basis of their statistical similarity as calculated on the basis of one or more qualitative or quantitative attributes. Typically, members of groups (classes) so derived display greater statistical similarity to other members of the same group than to all other members of the population. In this regard, several method-based decisions are influential in determining group memberships:

- The choice of measure used to assess statistical similarity between population members -- the coefficient of similarity;

- The choice of algorithm used to group population members; and

- The choice of attributes (variables) used to describe each population member.

Researchers have proposed numerous different coefficients of similarity for use in numerical taxonomy. Where attribute descriptions are rendered into quantitative rather than qualitative distinctions, however, euclidean distance is by far the most common metric used to express similarity or dissimilarity between members of a population. Euclidean distance, *d*, equals

$$d_{pq} = \left[(1/M)\sum(x_{ip} - x_{iq})^2\right]^{1/2},$$

where p and q are any two cases, M is the number of variables used to describe the population, and x_{ip} and x_{iq} are the values of variable i for cases p and q, respectively. The larger the value of d, the further apart (more dissimilar) any two cases are, and vice versa; when d is equal to zero, cases are identical. Because of its wide use and ease of interpretation, we used a euclidean distance measure exclusively.

A wide variety of general statistical procedures may be used to partition a population numerically into constituent groups; these include such methods as factor analysis, cluster analysis, and several others. Although each has its virtues, we chose to use cluster analysis because it offered the most flexible procedure for dealing with the kinds of variables and cases under consideration. At the same time, the term cluster analysis does not include just a single computational algorithm; it includes numerous techniques for partitioning a population that differ according to how each treats intra and intercluster (group) distances (see Anderberg 1973 for an in-depth consideration of various clustering algorithms). Importantly, results may be technique-dependent; the clusters resulting from the application of a particular partitioning technique may be different than those arising from applying another technique. Consequently, to achieve a "global solution" it is often necessary to perform multiple analyses using several different clustering algorithms to avoid solutions that are only local minimums. For the purposes of this analysis, we used three different clustering techniques: single linkage, average linkage, and k-means. These and several other algorithms are available in a single computational package known as CLUSTAN (Wishart 1968), and we used this program as implemented at the University of Washington Academic Computing Center.

We sought to create groupings that would allow us to identify the kinds of historical trends we saw in the evolution of point styles throughout the Columbia Plateau region. Because all such historical patterns relate to object morphology, the attributes we chose to describe each point were confined to metrics that have specifiable consequences for artifact shapes.

For the purposes of this analysis, we first separated projectile points into two categories depending upon whether a point exhibits an identifiable, separate haft element (stemmed) or not (unstemmed). We undertook separate numerical analyses of each of these categories.

Figures 6.3 and 6.4 portray the dimensional attributes we used as the basis for our metrical characterizations of stemmed and unstemmed points, respectively. As appropriate, analysts measured these attributes on each point and entered the resultant data onto STYLAN forms for further transformation and analysis. Using these measures, we developed a series of indices to provide quantitative equivalents for the kinds of historical stylistic trends that we identified previously. For example, one aspect of stem morphology can be specified by computing the ratio of basal edge width to upper stem width, or W_{BE}/W_S : ratios approaching 1.0 are indicative of straight haft elements, ratios less than 1.0 denote contracting stems, and ratios greater than 1.0 denote expanding stems.

For stemmed points, we used these indices:

- W/L;
- W_P/L;
- W_{BE}/W_S;
- L_{HA}/L_{HL};
- W_S/W_{BL};
- $(L - L_{HL})/L_B$;
- $(L - L_{HL} - L_B)/[(W_{BL} - W_S)/2]$; and
- $[(W_{BE} - W_S)/2]/L_{HL}$.

For unstemmed points, we developed a different set of indices:

- W_M/L_L;
- W_B/L_L;
- W_{MP}/L_L;
- $(L_L - L_A)/W_M$; and
- L_L.

We used the calculated morphometric indices as input data into the CLUSTAN 1C program package. Indices for 68 stemmed and 24 unstemmed projectile points provided the basic data sets for all analyses. We used only complete specimens; broken points later were assigned manually to recognized clusters on the basis of any remaining metric attributes. For each data set, we made three separate computer runs, each using a different clustering algorithm. The virtual one-to-one correspon-dence among the three solutions strongly suggests that resultant clusters are largely independent of the technique.

Output from the CLUSTAN 1C package consists of a dendrogram showing the history of successive linkages at each stage of clustering

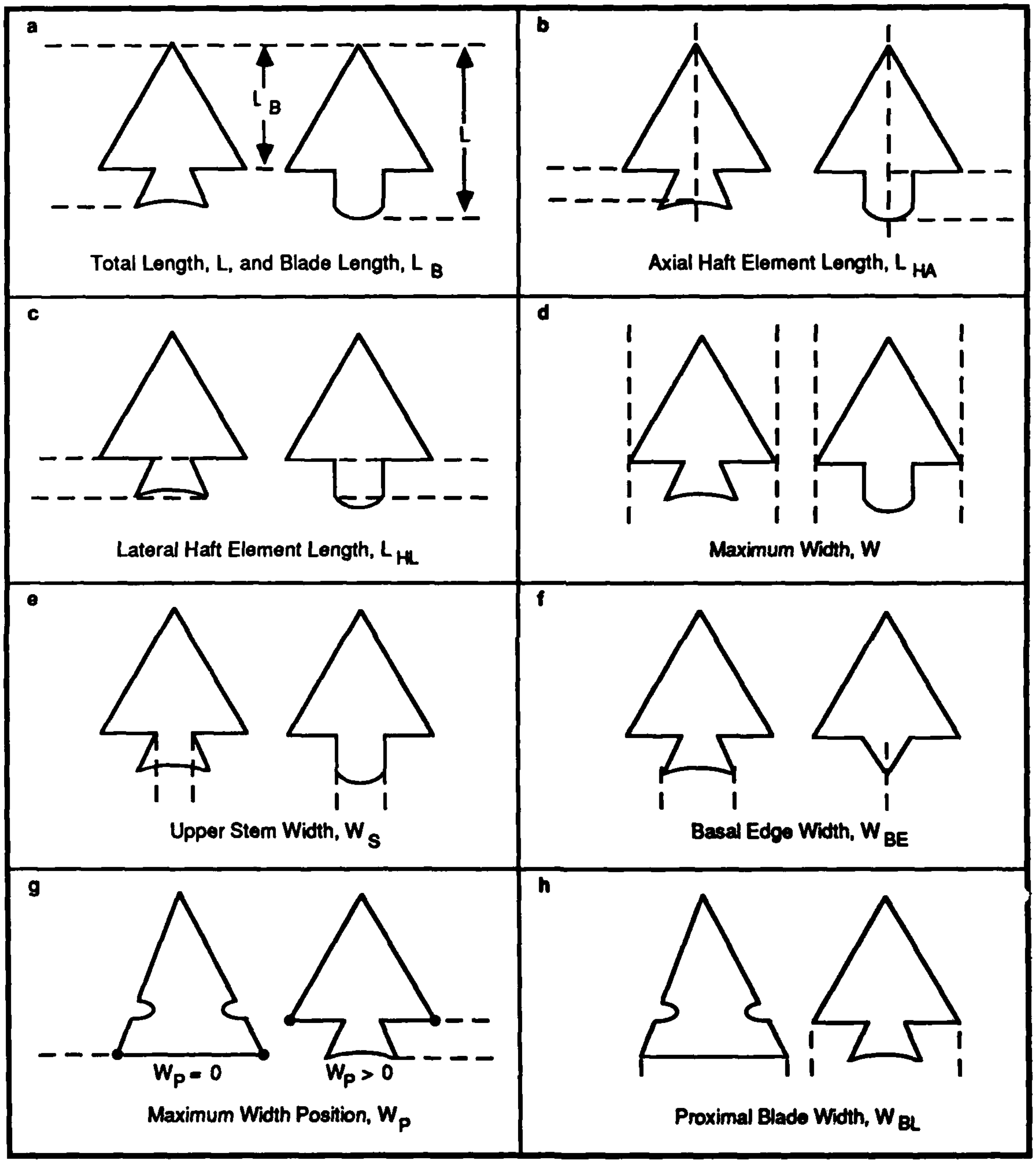

Figure 6.3. Dimensional attributes for stemmed projectile points.

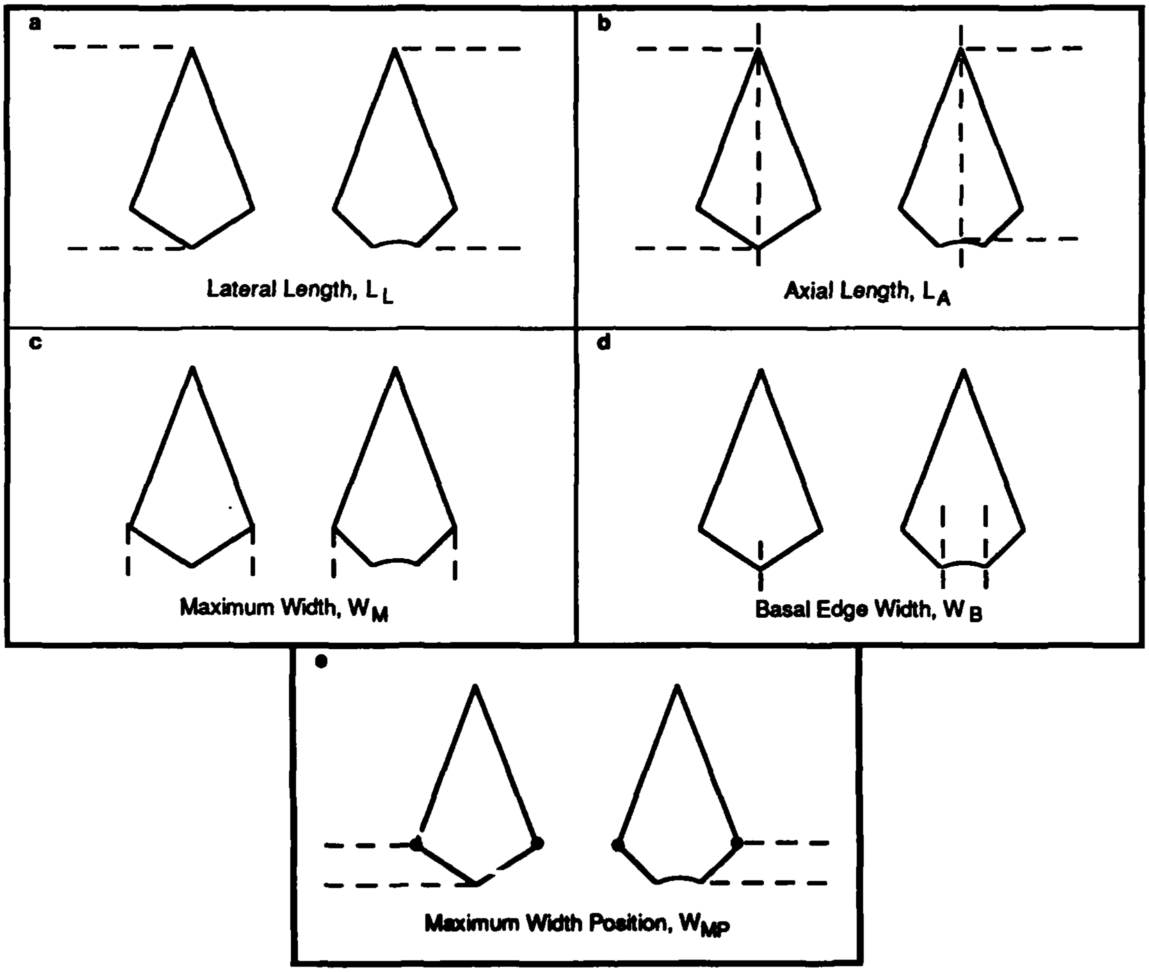

Figure 6.4. Dimensional attributes for unstemmed projectile points.

Table 6.8
Formal Attributes of Subsurface Features

Site	Feature Number	Size, cm		Shape		Contents							
		Horizontal	Vertical	Plan	Profile	FMR	Charcoal	Burnt Soil	Ash	Bone	Shell	Lithics	Ochre
45-DO-204	1	60	30	Ovoid	Basin-shaped	X	X	X					
45-DO-204	2	Ind.	N/A	Linear	Layer (surface)	X	X			X		X	
45-DO-214	1	50	20	Circular	Basin-shaped		X						
45-DO-242	1	Ind.	N/A	Linear	Layer (surface)		X	X		X	X	X	
45-OK-11	1	49	12	Ovoid	Basin-shaped	X	X	X		X	X	X	X
45-OK-20	2	30	10	Circular	Basin-shaped		X			X			
45-OK-168	1	17	4	Circular	Lenticular		X						
45-OK-258	1	90 x 68	28	Ovoid	Basin-shaped		X	X		X	X	X	
45-OK-258	2	Ind.	Ind.	Circular	Basin-shaped		X	X					
45-OK-275	1	Ind.	N/A	Linear	Layer (surface)	X				X	X	X	
45-OK-292	1	Ind.	Ind.	Ovoid	Lenticular	X	X	X					
45-OK-310	1	70	25	Circular	Basin-shaped		X	X	X				
45-OK-311	1	40	15	Circular	Basin-shaped	X	X						

and a series of tables listing the contents and diagnostic statistics of each cluster. Based on results obtained from the three computer runs, we identified 12 clusters of stemmed points and a like number of unstemmed point clusters. We defined an additional stemmed group on the basis of broken specimens not included in our computer analyses. Descriptions and representative examples of all stemmed and unstemmed point clusters are provided in Appendix B along with summaries of the statistical characteristics of each cluster in terms of both the original attributes we measured on each point and the shape indices we claculated and supplied to CLUSTAN as input variables. Appendix B also includes information about the temporal distributions of the point classes; however, my discussion of this aspect of variability is reserved until a later chapter.

Features

In addition to discrete, portable artifacts recovered from test excavations, we recorded several surface and subsurface cultural features that could provide information about local settlement - subsistence patterns. These data also were important for management planning purposes (cf., Jermann et al. 1978).

Subsurface Features

We recorded 13 subsurface features during the site testing program. Most of these exhibit distinct, identifiable horizontal and vertical spatial boundaries, such as pits and shallow depressions; however, excavators also recorded unusually dense concentrations of lithics, shell, bone, or charcoal as features, even though they lacked specifiable horizontal or vertical limits. These latter features likely represent areas in which a restricted set of cultural activities (e.g., tool manufacturing, refuse disposal) occurred.

Table 6.8 provides basic information about the structure and contents of all recorded subsurface features. Judging by their contents and depth, most appear to be small, circular hearths or earth ovens. This is not to say, however, that other types of features do not occur. Instead, any conclusions we might make about the numbers and kinds of features at a given site on the basis of survey data must take into account the nature of our testing program. Characterization or even identification of cultural features is dependent on the size of sampling unit used to access site deposits; the smaller the sampling unit, the smaller the feature we can encompass and see. Consequently, given that we used testing units

that were 1x2-meters in horizontal extent, it is not surprising that we recorded mostly small features.

Surface Features

Twenty of the sites we tested exhibited surface depressions potentially indicative of domestic cultural structures or houses. Most of these features are circular or nearly circular in horizontal plan and range in diameter from 4 meters to over 16 meters (Table 6.9). Although we presume that most depressions result from housepits, it is possible that some of them are the remains of sweat lodges or other large nonresidential structures.

Plateau researchers have long been interested in variability in the number and sizes of housepits at prehistoric sites (Swanson 1958; Warren 1960; Grabert 1971; Stryd 1971) and the potential temporal and social significance of observed patterns. For example, Grabert (1971) sees two long-term temporal regularities in the archaeological record:

- The number of dwellings per site tends to increase through time; and
- The size and depth of these dwellings *decrease through time.*

Stryd (1971) further suggests that large pit houses seldom occur alone and that large and small structures co-occur at sites with large numbers of structures. This pattern is believed to reflect differences in either the functions of structures or social rank or family stability (Stryd 1971; Stryd and Hills 1972).

Figure 6.5 presents frequency distribution data for the number of depressions per site and the sizes (areas) of these recorded features. The observed distributions indicate that a considerable range exists in the numbers and sizes of surface depressions occurring reservoir-wide. Nevertheless, considerably less variation occurs in the sizes of these surface features within sites than between sites; intersite "housepit" sizes tend to be fairly uniform (see Table 6.9). This would seem to suggest that settlements in the project area tend to lack the kind of internal variability that Stryd noted in the northern Plateau region.

Multiple modes occur in the distributions of surface housepit sizes and numbers. These modes suggest that important differences occur in settlement structure that may have functional, temporal, or geographic significance, and these are considerations that I address in later chapters of this report. In addition, we used the number and size of "housepits" to classify occupation components for resource management purposes (see Jermann et al. 1978) for a full description of this procedure).

Table 6.9
Formal Attributes of Surface-evident Features

Site	Surface Feature #	Feature Size, m Length	Width	Feature Area, m^2
45-DO-284	1	11	11	95
	2	15	17	200
45-OK-2A	1	19	19	284
	2	19	18	269
45-OK-12	1	8	8	50
	2	8	8	50
45-OK-20	1	14	13	143
	2	18	15	212
45-OK-28	1	5	9	35
	2	7	7	38
	3	7	7	38
	4	6	4	19
	5	5	4	16
	6	6	6	28
45-OK-158	1	10	9	71
	2	13	9	92
45-OK-168	1	9	7	49
45-OK-226	1	6	6	28
45-OK-239	1	8	4	25
	2	16	12	151
	3	12	10	94
	4	13	13	133
	5	14	8	88
	6	13	13	133
	7	10	8	63
	8	9	7	49
	9	12	7	66
	10	8	7	44
	11	10	9	71
	12	9	8	57
	13	8	6	38
45-OK-244	1	5	4	16
	2	6	4	19
	3	5	4	16
	4	9	4	28
45-OK-245	1	7	6	33
45-OK-246	1	12	8	75
	2	11	6	52
45-OK-247	1	11	8	69
45-OK-254	1	4	3	9
	2	5	4	16
	3	5	4	16
45-OK-257	1	9	9	64
	2	16	16	201
	3	14	14	154
	4	14	14	154
	5	10	10	79
45-OK-258	1	15	8	94
	2	12	8	75
	3	10	5	39
	4	9	4	28

Table 6.9 (Continued)

Site	Surface Feature #	Feature Size, m Length	Width	Feature Area, m^2
45-OK-265	1	7	6	33
	2	9	9	64
	3	9	7	49
	4	4.5	4	14
	5	7	7	38
45-OK-289	1	5	5	20
45-OK-292	1	8	5	31
	2	8	5	31
45-OK-340	1	9	7	49
	2	4	4	13
	3	9	6	42
	4	10	7	55
	5	8	7	44
	6	5	5	20
	7	5	4	16
	8	5	4	16
	9	5	4	16

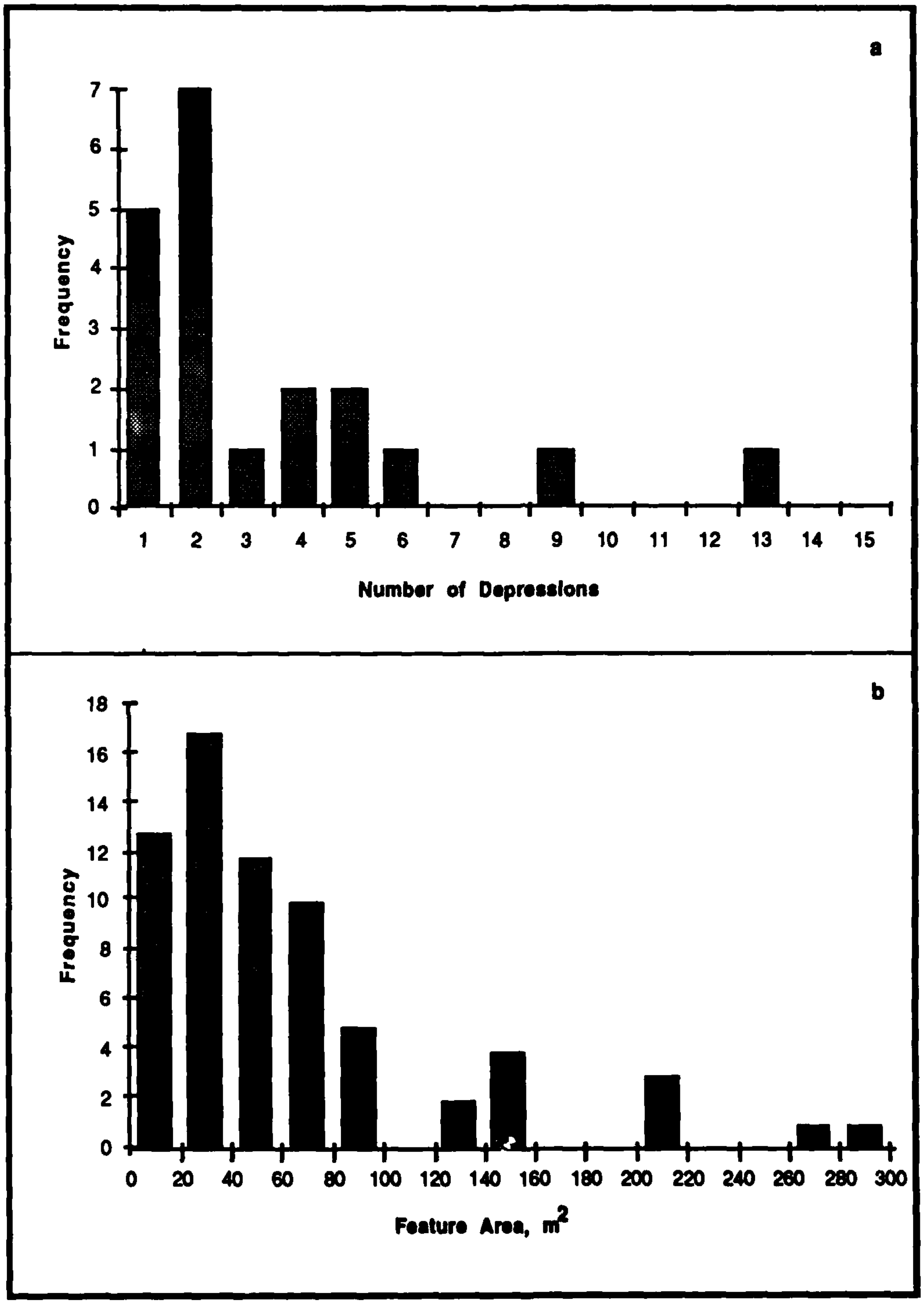

Figure 6.5. Frequency distributions of number of surface depressions (a) and area of depressions (b).

7. Occupation Component Identification and Characterization

Having classified the various material aspects of the entire testing assemblage, we then focused on identifying and characterizing a set of bounded geographic analytic units that we could use for follow-on research and management purposes. Although sites -- limited geographic areas within which cultural materials occur -- may provide important administrative constructs for recording occurrences of cultural materials and are useful tactical units for data collection, cultural materials recovered from the same site may, in fact, owe their existence to distinct, independent natural or cultural depositional events. Consequently, for research and management purposes, site assemblages recovered as part of the Chief Joseph Dam Cultural Resources Survey Project are subdivided into smaller spatial units -- occupation components -- that represent more circumscribed sets of cultural events than site assemblages as a whole, and thus are more amenable to interpretation. They provide a basis for *intrasite* comparisons and also are the most appropriate units for analysis and interpretation of reservoir-wide temporal and geographic variability.

In this chapter, I describe the measures we use to identify and characterize occupation components. In this regard, I first discuss how these site-based analytic units are defined and then summarize their material cultural contents. This is followed by a consideration of the temporal placement of each component.

Component Identification

The first step in identifying occupation components in the testing assemblage was to delimit vertical discontinuities in the density of cultural materials recovered from each testing unit, breaks that might correspond to distinct episodes of site use. Because all 10-centimeter unit levels are equivalent in volume, we could compare the absolute frequencies of culturally deposited materials both within and between each 1x1-meter test quadrat; the counts of artifacts in each unit level constitute a systematic vertical sample of the density of cultural materials.

To distinguish cultural strata at any given site, we first generated a series of histograms of unit level frequencies for fire-modified rock (FMR), shell, bone, cryptocrystalline materials, and worn or manufactured objects. We then examined each plot for distributional modes, and where these occurred, they were used to define an initial set of cultural strata for further analysis.

The natural deposition sequence at a given locality is the most appropriate framework within which to organize a cultural deposition sequence. Because natural sedimentary strata are assumed to be time-parallel units over at least small horizontal distances, they provide the best means of correlating cultural stratigraphy across a site with any degree of confidence.

We used the natural stratigraphic boundaries in each test unit as temporal markers to assist us in subdividing cultural deposits. For each profiled test unit, we compared the horizontal and vertical distributions of artifacts in each level of each 1x1-meter quadrat with the natural deposition sequence. Discrete cultural deposits that were found to occur within an identifiable natural stratum, or set of strata, were defined as cultural components.

Although each natural stratum is a distinct temporal unit, no one-to-one correspondence necessarily exists between natural stratigraphic units and any cultural deposits that we may recognize. A single peak in a frequency histogram of cultural materials may be found to span several short-term natural deposits. At the same time, several distinct, vertically separated cultural strata may occur within a single massive natural stratum. For the purposes of this analysis, an occupation component is a single, identifiable cultural deposit that can be defined in terms of stratigraphic boundaries. Consequently, it may correspond to a single natural stratum, multiple adjacent strata, or a conformable subdivision of a single stratum -- natural strata may be split or aggregated so long as depositional principles and stratigraphic boundaries are not violated.

Using the methods and principles outlined above, we were able to identify 133 separate occupation components, and these units provide the basis for all subsequent analytic and interpretive efforts.

Component Contents

Having identified the cultural components occurring within each test site, the next step was to assign each provenience unit (unit/feature level) to an occupation component. Once this was accomplished, we could summarize the material contents of each component.

Tables 7.1 through 7.5 list the characteristics of all recognized occupation components according to several dimensions of formal, technological, and functional variability that I identified in the previous chapter. In addition, Appendix C enumerates the numbers of identified faunal specimens by taxa for each occupation component. In reviewing these tabulations, however, certain conventions in the numbering of occupation components are important. The components within a given site are sequentially numbered from earliest to latest; the earliest component is assigned the number "1", the next earliest component is designated "2", and so forth. Surface components are designated by the number "8" to distinguish them from components identified on the basis of excavated materials.

Temporal Characterization

Once we had identified the set of occupation components within the reservoir-wide testing assemblage that we would use for further analyses and resource management considerations, we focused on determining the chronological placement of these constructs. We used two separate methods to assign temporal ranges to individual components: absolute dating and relative dating.

Absolute Dating

To the maximum extent possible, we attempted to assign temporal ranges to individual occupation components on the basis of absolute dates as determined from radiocarbon analyses of organic samples collected from known cultural contexts. Ideally, one or more such samples would be available for radiometric age determinations from each occupation component. Unfortunately, this was not the case, and we were able to submit only 35 samples to the University of Texas Radiocarbon Dating Laboratory. Table 7.6 presents the results of their analyses.

Before considering the data in Table 7.6 any further, several cautionary notes are in order. One of the samples from 45-OK-158 (Tx-3060) comes from an excavation level that is beneath any known cultural deposits. Because its associated radiocarbon age determination apparently dates naturally occurring charcoal, I exclude this sample from subsequent analyses. The sample from 45-OK-226 (Tx-3125) is not dendrocorrected; the age determination on this sample lies outside the effective range of this technique, and its actual age likely is more recent than the uncorrected value. Finally, I must stress that many of the samples were obtained from screening of general unit level matrix. In such instances, laboratory processors combined all retained pieces of charcoal from a given unit level to create samples of sufficient size for radiocarbon dating. Although we made a concerted effort to ensure that aggregate samples were attributable to specifiable cultural contexts, it is possible that some of the age determinations on these samples do not accurately date identified occupation components. In the absence of evidence to the contrary, however, I use dates obtained from such aggregate samples in subsequent temporal analyses.

Figure 7.1 plots the means and 1-sigma ranges of all radiocarbon age determinations. Although the ranges, as expected, tend to increase with sample age, all but the sample from 45-DO-285 (Tx-3051) are of reasonable magnitude. The most important conclusion to be drawn from this display, however, it that available radiocarbon ages are distributed almost uniformly within the period 4,500 to 200 B.P. The only major exception to this is the noticeable paucity of samples within the range between 2,200 and 1,300 B.P.; only two samples occur during this period, and one of these (Tx-3051) is of doubtful reliability.

Although the observed pattern simply may be the result of sampling error, the virtual absence of age determinations for a period spanning nearly 1,000 years also may be an accurate reflection of the archaeological record. It is possible, for example, that the area was little used during this period or that natural processes (e.g., erosion) erased most of the archaeological deposits from this period. Available data, however, are not adequate to resolve the matter.

Relative Dating

The second method we used to assess the chronological placement of occupation components is relative dating based on the temporal ranges of available historical types -- in this case, the projectile point classes we defined

Table 7.1
Distribution of General Artifact Classes by Tested Site Component

			MATERIAL CATEGORY						
			Bone		Shell		FMR		Lithics
Site	Comp. #	Excav. Vol.(m^3)	#	Weight(g)	#	Weight(g)	#	Weight(g)	#
45-DO-102	1	5.7	53	130	0	0	101	7,626	56
45-DO-188	1	2.8	1	4	0	0	0	0	16
	2	1.9	23	4	0	0	0	0	142
45-DO-198	1	8.5	95	49	0	0	1	370	66
	2	8.2	52	33	0	0	2	250	43
45-DO-204	1	3.9	464	106	0	0	24	3,225	130
	2	2.4	536	280	0	0	58	9,730	60
	3	5.0	59	48	0	0	8	340	25
45-DO-211	1	5.1	238	174	1,140	3,093	0	0	130
	2	3.0	162	91	1,741	6,095	7	1,140	139
	3	2.9	41	46	32	95	0	0	79
45-DO-213	1	0.7	3	4	1	8	0	0	5
	2	2.8	40	28	3	29	5	275	24
45-DO-214	1	1.0	23	18	240	—[a]	22	1,594	51
	2	7.1	774	279	10	—	138	9,455	336
45-DO-215	1	2.5	6	4	58	290	0	0	8
	2	3.5	31	33	54	317	5	560	86
45-DO-220	1	3.7	4	2	0	0	0	0	17
	2	1.9	0	0	0	0	7	900	8
45-DO-221	1	7.0	5	4	0	0	0	0	7
45-DO-222	1	2.0	0	0	0	0	1	700	20
	2	2.3	2	4	0	0	0	0	1
45-DO-233	1	4.5	8	4	6	2	40	3,955	28
45-DO-234	1	3.3	76	31	0	0	7	777	4
	2	2.3	6	8	0	0	4	60	0
45-DO-242	1	2.0	217	264	82	217	1	40	14
	2	3.9	281	212	139	495	29	2,370	51
	3	3.1	40	40	526	4,152	17	6,732	21
45-DO-243	1	2.4	210	158	0	2	0	0	29
	2	2.8	29	31	0	4	9	1,400	48
45-DO-248	1	3.8	6	6	15	30	9	1,270	59
45-DO-254	1	2.2	135	90	150	449	2	70	20
	2	2.8	134	54	1,012	3,618	98	13,780	25
	3	2.0	75	73	58	158	2	21	26
45-DO-262	1	4.5	0	0	0	0	9	955	29
45-DO-265	1	5.2	1	2	0	0	1	1,340	6
45-DO-273	1	0.8	7	4	0	0	0	0	8
	2	1.4	1	2	0	2	0	0	23
	3	3.5	4	6	0	0	5	1,220	27
45-DO-276	1	5.1	1,155	446	3	10	58	12,010	205
45-DO-282	1	4.2	77	22	0	0	0	0	42
	2	4.8	29	18	0	4	0	0	267
	3	5.4	15	20	0	0	0	0	419
	4	6.5	26	26	0	2	0	0	305
45-DO-284	1	6.7	48	174	0	0	77	22,278	35
45-DO-285	1	2.5	1,485	1,746	0	0	159	17,808	1,440
	2	2.4	36	12	0	0	17	914	136
45-DO-312	1	3.4	0	0	0	0	0	0	25
	2	1.8	1	2	0	0	0	0	12
45-DO-325	1	2.3	643	438	120	374	130	36,525	650
45-OK-2A	1	5.2	41	40	32	—	42	4,300	15
	2	15.2	323	266	737	—	413	38,018	126
45-OK-11	1	24.0	3,444	4,764	1,548	—	295	32,429	338
	2	17.5	919	441	42	—	585	50,778	547

Table 7.1 (Continued)

Site	Comp. #	Excav. Vol.(m^3)	MATERIAL CATEGORY Bone #	Bone Weight(g)	Shell #	Shell Weight(g)	FMR #	FMR Weight(g)	Lithics #
45-OK-12	1	3.8	119	69	27	153	2	53	1
	2	1.6	207	94	141	563	12	1,198	17
	3	1.8	381	151	251	789	58	7,717	20
45-OK-18	1	2.5	6	8	0	0	12	2,690	27
	2	2.6	18	18	0	0	75	5,425	52
45-OK-20	1	17.8	1,507	841	55	---	783	56,067	812
45-OK-28	1	3.0	6	36	0	0	4	230	0
45-OK-158	1	4.5	451	316	0	0	169	22,830	68
45-OK-168	1	3.0	410	299	1,812	7,026	277	40,856	161
	2	2.2	38	32	72	332	54	7,389	40
45-OK-226	1	1.0	0	0	0	0	0	0	13
	2	2.4	22	51	0	2	101	12,120	151
45-OK-229	1	8.9	59	102	0	0	131	36,662	81
45-OK-239	1	8.9	1,464	726	250	---	263	16,009	1,030
	2	9.4	823	565	457	---	490	104,625	394
45-OK-244	1	1.2	4	8	0	0	24	925	67
	2	2.4	19	15	55	---	135	27,979	57
45-OK-245	1	3.9	111	68	47	---	106	9,020	563
45-OK-246	1	3.9	35	40	0	6	2	64	9
45-OK-247	1	0.8	0	0	0	0	0	0	18
	2	1.8	0	0	0	0	0	0	24
45-OK-248	1	4.5	61	58	51	223	3	30	14
	2	4.3	56	43	848	4,937	77	8,708	85
45-OK-250	1	1.0	205	119	139	574	7	521	10
	2	5.0	2,097	809	907	3,675	93	9,591	151
	3	2.7	623	269	53	161	33	2,356	93
	4	1.4	92	35	17	33	1	370	121
45-OK-253	1	4.2	396	315	1,193	6,108	47	6,356	34
	2	1.8	29	28	21	90	4	470	6
45-OK-254	1	4.4	142	72	46	---	14	730	25
	2	5.2	147	74	31	---	57	4,240	46
45-OK-255	1	8.2	971	303	191	946	16	3,435	57
	2	6.2	84	47	6	34	13	819	26
45-OK-256	1	1.5	439	358	372	1,515	25	3164	47
	2	2.5	269	104	24	81	24	3064	18
45-OK-257	1	10.8	3,543	1,661	548	3,176	309	26,588	365
	2	5.0	487	198	23	103	78	2,953	120
45-OK-258	1	1.3	65	43	34	---	4	200	10
	2	3.8	390	232	275	---	177	30,545	92
	3	6.3	899	728	1,028	---	233	17,344	131
	4	1.2	110	42	24	---	119	12,145	42
45-OK-259	1	1.2	3	5	0	2	7	485	4
45-OK-261	1	1.2	2	4	0	0	14	1,937	9
	2	1.9	1	2	0	4	19	1,262	17
45-OK-264	1	5.2	22	10	4	68	10	328	6
	2	1.0	0	0	0	0	6	52	0
45-OK-265	1	10.7	123	138	1	0	119	6,640	37
45-OK-274	1	0.7	4	6	0	0	7	165	2
	2	1.5	772	406	60	---	313	33,810	63
	3	1.3	1,365	748	17	---	874	70,081	145
45-OK-275	1	7.0	618	410	26	---	148	23,931	251
	2	9.1	1,129	864	5	---	223	24,604	233
	3	2.7	134	78	9	---	51	4,274	47

Table 7.1 (Continued)

Site	Comp. #	Excav. Vol.(m^3)	MATERIAL CATEGORY: Bone #	Bone Weight(g)	Shell #	Shell Weight(g)	FMR #	FMR Weight(g)	Lithics #
45-OK-280	1	2.4	195	168	250	---	16	2,095	20
	2	10.8	184	158	1,138	---	137	12,975	76
	3	8.3	22	26	47	---	54	8,595	115
45-OK-287	1	2.1	17	14	2	22	58	10,510	26
45-OK-288	1	2.5	158	71	0	0	10	2,140	29
	2	2.0	165	66	0	0	60	10,180	43
	3	1.9	13	4	0	0	0	0	4
45-OK-289	1	3.6	13	4	0	0	0	0	4
45-OK-292	1	0.9	14	16	39	0	1	26	1
	2	3.8	172	97	4	0	212	24,665	201
	3	2.2	12	10	0	0	23	1,705	36
45-OK-303	1	4.6	3	6	0	20	0	0	8
45-OK-309	1	3.0	15	20	1	39	1	90	265
	2	4.8	5	4	0	0	0	0	18
45-OK-310	1	2.8	0	0	0	0	5	728	8
	8	0.0	0	0	0	0	0	0	15
45-OK-311	1	9.1	1	2	0	0	114	2,338	19
45-OK-312	1	3.8	12	16	0	0	2	190	6
	2	1.0	0	0	0	0	27	204	13
45-OK-313	1	1.8	0	1	2	0	3	80	7
	2	1.1	2	8	6	0	11	830	16
	8	0.0	0	0	0	0	0	0	16
45-OK-314	1	1.8	0	0	0	0	0	0	4
45-OK-340	1	4.4	0	0	4	18	0	0	7
45-OK-347	1	11.5	29	28	5	44	3	228	48
	2	6.2	4	6	0	8	1	35	27
Total Count	143	550.0	34,078	23,114	18,367	50,198	8,949	1,015,886	13,373
Density[1]			62.0	42.0	33.4	131.4	16.3	1,846.4	24.3

[a] Not Reported
[1] Value per cubic meter

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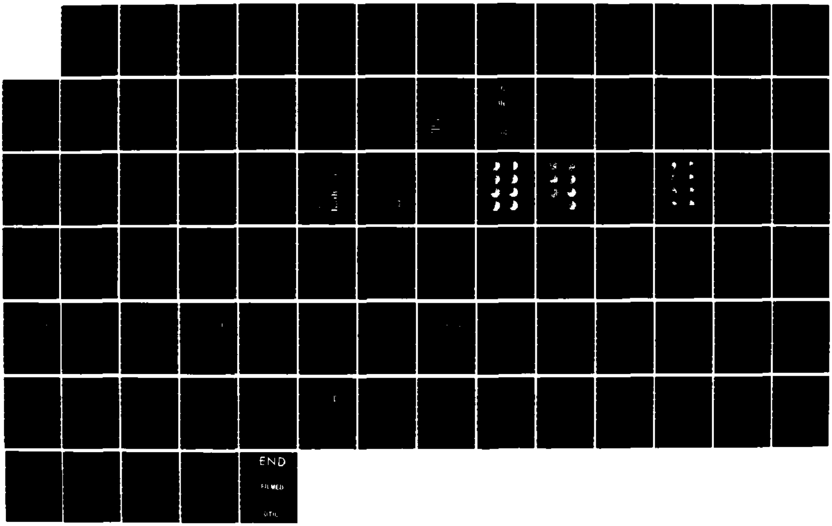

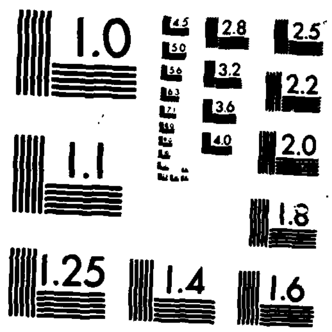

MICROCOPY RESOLUTION TEST CHART
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Table 7.2
Number of Identifiable Specimens (NISP) by Tested Site Component

Site	Comp. #	Excav. Vol.(m^3)	FAUNAL CATEGORY Large Herb.	Small Herb.	Carniv.	Fish	Turtle	Mollusc[1]
45-DO-102	1	5.7	3	0	0	1	0	0
45-DO-188	1	2.8	0	0	0	0	0	0
	2	1.9	1	0	0	0	0	0
45-DO-198	1	8.5	16	0	0	1	0	0
	2	8.2	18	0	0	0	0	0
45-DO-204	1	3.9	0	0	0	0	0	0
	2	2.4	0	0	0	0	0	0
	3	5.0	0	0	0	0	0	0
45-DO-211	1	5.1	33	0	0	16	6	1,140
	2	3.0	31	1	0	4	0	1,741
	3	2.9	16	1	0	0	0	32
45-DO-213	1	0.7	1	0	0	0	0	1
	2	2.8	13	1	0	0	0	3
45-DO-214	1	1.0	1	0	0	0	0	240
	2	7.1	12	4	0	4	0	10
45-DO-215	1	2.5	0	0	0	0	0	58
	2	3.5	5	1	0	0	0	54
45-DO-220	1	3.7	1	0	1	0	0	0
	2	1.9	0	0	0	0	0	0
45-DO-221	1	7.0	1	0	0	0	0	0
45-DO-222	1	2.0	0	0	0	0	0	0
	2	2.3	1	0	0	0	0	0
45-DO-233	1	4.5	0	0	0	0	0	6
45-DO-234	1	3.3	13	1	0	0	1	0
	2	2.3	1	0	0	0	0	0
45-DO-242	1	2.0	18	0	0	1	0	82
	2	3.9	38	0	0	0	0	139
	3	3.1	17	0	0	1	0	526
45-DO-243	1	2.4	13	0	0	0	0	0
	2	2.8	3	0	0	0	0	0
45-DO-248	1	3.8	22	0	0	0	0	15
45-DO-254	1	2.2	21	0	0	10	0	150
	2	2.8	20	0	0	1	2	1,012
	3	2.0	12	0	0	0	0	58
45-DO-262	1	4.5	0	0	0	0	0	0
45-DO-265	1	5.2	0	0	0	0	0	0
45-DO-273	1	0.8	0	0	0	0	0	0
	2	1.4	1	0	0	0	0	0
	3	3.5	1	0	0	0	0	0
45-DO-276	1	5.1	42	22	0	4	0	3
45-DO-282	1	4.2	0	0	0	4	0	0
	2	4.8	1	0	0	1	0	0
	3	5.4	1	1	0	3	0	0
	4	6.5	2	1	0	1	1	0
45-DO-284	1	6.7	2	0	1	2	0	0
45-DO-285	1	2.5	0	0	0	0	0	0
	2	2.4	26	3	1	0	0	0
45-DO-312	1	3.4	0	0	0	0	0	0
	2	1.8	0	0	0	0	0	0
45-DO-325	1	2.3	9	9	1	14	0	120
45-OK-2A	1	5.2	2	0	0	2	1	32
	2	15.2	13	0	0	0	0	737
45-OK-11	1	24.0	441	11	1	3	4	1,548
	2	17.5	28	3	0	6	3	42

Table 7.2 (Continued)

Site	Comp. #	Excav. Vol.(m^3)	FAUNAL CATEGORY Large Herb.	Small Herb.	Carniv.	Fish	Turtle	Mollusc[1]
45-OK-12	1	3.8	29	0	0	0	0	27
	2	1.6	17	1	0	0	0	141
	3	1.8	22	2	1	0	0	251
45-OK-18	1	2.5	1	0	0	1	0	0
	2	2.6	1	0	0	0	1	0
45-OK-20	1	17.8	50	7	0	0	0	55
45-OK-28	1	3.0	0	0	0	0	0	0
45-OK-158	1	4.5	8	0	0	0	0	0
45-OK-168	1	3.0	16	1	0	0	1	1,812
	2	2.2	8	0	0	0	0	72
45-OK-226	1	1.0	0	0	0	0	0	0
	2	2.6	6	0	0	0	0	0
45-OK-229	1	8.9	2	0	0	0	0	0
45-OK-239	1	8.9	40	0	0	0	0	250
	2	9.4	9	0	1	1	0	457
45-OK-244	1	1.2	0	0	0	0	0	0
	2	2.4	0	0	0	0	1	55
45-OK-245	1	3.9	3	0	0	0	0	47
45-OK-246	1	3.9	14	0	0	0	0	0
45-OK-247	1	0.8	0	0	0	0	0	0
	2	1.8	0	0	0	0	0	0
45-OK-248	1	4.5	13	0	0	0	0	51
	2	4.3	17	0	0	0	0	848
45-OK-250	1	1.0	14	0	0	7	0	139
	2	5.0	69	0	0	16	2	907
	3	2.7	30	0	0	1	1	53
	4	1.4	8	0	0	0	1	17
45-OK-253	1	4.2	44	0	1	0	3	1,193
	2	1.8	9	0	0	0	0	21
45-OK-254	1	4.4	2	0	0	0	0	46
	2	5.2	3	0	0	1	0	31
45-OK-255	1	8.2	28	0	0	1	0	191
	2	6.2	19	0	0	3	0	6
45-OK-256	1	1.5	0	0	0	0	0	372
	2	2.5	0	0	0	0	0	24
45-OK-257	1	10.8	75	2	1	13	4	548
	2	5.0	19	0	0	5	1	23
45-OK-258	1	1.3	0	0	0	0	0	34
	2	3.8	9	0	4	0	0	275
	3	6.3	27	0	0	0	0	1,028
	4	1.2	2	0	0	0	0	24
45-OK-259	1	1.2	1	0	0	0	0	0
45-OK-261	1	1.2	2	0	0	0	0	0
	2	1.9	0	1	0	0	0	0
45-OK-264	1	5.2	2	0	0	0	0	4
	2	1.0	0	0	0	0	0	0
45-OK-265	1	10.7	2	0	0	0	0	1
45-OK-274	1	0.7	0	0	0	0	0	0
	2	1.5	18	1	0	0	0	60
	3	1.3	31	1	0	2	0	17
45-OK-275	1	7.0	28	2	1	0	0	26
	2	9.1	23	0	0	0	0	5
	3	2.7	3	0	0	0	0	9

Table 7.2 (Continued)

Site	Comp. #	Excav. Vol.(m³)	FAUNAL CATEGORY Large Herb.	Small Herb.	Carniv.	Fish	Turtle	Mollusc[1]
45-OK-280	1	2.4	3	0	0	1	1	250
	2	10.8	9	0	0	1	0	1,138
	3	8.3	0	0	1	0	0	47
45-OK-287	1	2.1	3	2	0	0	0	2
45-OK-288	1	2.5	15	0	0	0	0	0
	2	2.0	12	0	0	2	0	0
	3	1.9	3	0	0	0	0	0
45-OK-289	1	3.6	1	0	0	0	0	0
45-OK-292	1	0.9	0	0	0	0	0	39
	2	3.8	3	0	0	0	0	4
	3	2.2	0	0	0	3	0	0
45-OK-303	1	4.6	1	0	0	0	0	0
45-OK-309	1	3.0	1	0	0	0	6	1
	2	4.8	1	0	0	0	0	0
45-OK-310	1	2.8	0	0	0	0	0	0
	8	0.0	0	0	0	0	0	0
45-OK-311	1	9.1	0	0	0	0	0	0
45-OK-312	1	3.8	3	0	0	0	0	0
	2	1.0	0	0	0	0	0	0
45-OK-313	1	1.8	0	0	0	0	0	2
	2	1.1	2	0	0	0	0	6
	8	0.0	0	0	0	0	0	0
45-OK-314	1	1.8	0	0	0	0	0	0
45-OK-340	1	4.4	0	0	0	0	0	4
45-OK-347	1	11.5	10	0	0	0	0	5
	2	6.2	3	0	0	0	0	0
Total Count		550.2	1,694	79	15	137	40	18,367
Density[2]			3.08	0.14	0.03	0.25	0.07	33.38

[1] Number of identified hinges
[2] Count per cubic meter

Table 7.3
Distribution of Lithic Material Types by Tested Site Components

Site	Comp. #	Excav. Vol.(m^3)	Material Type						Total
			Jasper	Chalced.	Quartzite	Basalt	Granite	Argillite	
45-DO-102	1	5.7	24	20	9	0	1	0	54
45-DO-188	1	2.8	9	6	0	0	0	0	15
	2	1.9	110	22	4	2	0	0	138
45-DO-198	1	8.5	51	12	1	1	0	1	66
	2	8.2	28	8	6	0	1	0	43
45-DO-204	1	3.9	47	26	39	3	1	12	128
	2	2.4	26	13	13	0	1	6	59
	3	5.0	16	4	4	0	0	1	25
45-DO-211	1	5.1	83	6	33	1	1	3	127
	2	3.0	70	5	60	1	0	3	139
	3	2.9	55	5	19	1	0	0	80
45-DO-213	1	0.7	3	0	2	0	0	0	5
	2	2.8	9	5	9	0	0	0	23
45-DO-214	1	1.0	29	5	15	1	1	0	51
	2	7.1	282	36	14	1	0	0	333
45-DO-215	1	2.5	3	0	5	0	0	0	8
	2	3.5	24	3	58	0	0	0	85
45-DO-220	1	3.7	14	1	1	1	0	0	17
	2	1.9	4	1	3	0	0	0	8
45-DO-221	1	7.0	6	1	0	0	0	0	7
45-DO-222	1	2.0	15	4	1	0	0	0	20
	2	2.3	0	1	0	0	0	0	1
45-DO-233	1	4.5	25	2	0	0	0	0	27
45-DO-234	1	3.3	3	0	1	0	0	0	4
	2	2.3	0	0	0	0	0	0	0
45-DO-242	1	2.0	7	0	4	2	0	0	13
	2	3.9	39	7	4	0	0	0	50
	3	3.1	7	7	6	0	0	0	20
45-DO-243	1	2.4	22	4	3	0	0	0	29
	2	2.8	31	8	7	0	0	2	48
45-DO-248	1	3.8	51	5	0	0	1	1	58
45-DO-254	1	2.2	4	1	14	0	0	0	19
	2	2.8	10	1	7	0	0	0	18
	3	2.0	21	1	4	0	0	0	26
45-DO-262	1	4.5	2	1	23	0	1	0	27
45-DO-265	1	5.2	4	1	1	0	0	0	6
45-DO-273	1	0.8	5	2	0	0	0	0	7
	2	1.4	15	7	1	0	0	0	23
	3	3.5	14	6	6	0	1	0	27
45-DO-276	1	5.1	87	50	37	3	0	16	193
45-DO-282	1	4.2	19	21	1	0	0	0	41
	2	4.8	151	105	5	2	0	0	263
	3	5.4	245	160	7	1	0	2	415
	4	6.5	178	104	10	1	0	2	295
45-DO-284	1	6.7	13	7	12	1	1	1	35
45-DO-285	1	2.5	1,052	129	76	1	8	166	1,432
	2	2.4	98	16	14	0	2	4	134
45-DO-312	1	3.4	18	4	2	0	1	0	25
	2	1.8	8	2	1	0	0	1	12
45-DO-325	1	2.3	399	161	74	13	2	0	649
45-OK-2A	1	5.2	7	0	3	0	1	4	15
	2	15.2	71	4	12	6	3	25	121
45-OK-11	1	24.0	112	9	175	17	12	5	330
	2	17.5	330	14	162	14	4	7	531

Table 7.3 (Continued)

Site	Comp. #	Excav. Vol.(m^3)	Material Type						Total
			Jasper	Chalced.	Quartzite	Basalt	Granite	Argillite	
45-OK-12	1	3.8	1	0	0	0	0	0	1
	2	1.6	14	2	0	1	0	0	17
	3	1.8	10	2	7	0	0	0	19
45-OK-18	1	2.5	14	7	4	1	0	1	27
	2	2.6	26	10	8	2	1	2	49
45-OK-20	1	17.8	575	160	55	9	5	1	805
45-OK-28	1	3.0	0	0	0	0	0	0	0
45-OK-158	1	4.5	29	14	18	1	6	0	68
45-OK-168	1	3.0	106	8	40	1	1	3	159
	2	2.2	30	3	5	0	0	2	40
45-OK-226	1	1.0	10	3	0	0	0	0	13
	2	2.6	109	28	6	4	2	1	150
45-OK-229	1	8.9	40	23	16	2	2	1	84
45-OK-239	1	8.9	818	94	74	15	8	9	1,018
	2	9.4	288	34	47	6	5	10	390
45-OK-244	1	1.2	64	1	2	0	0	0	67
	2	2.4	47	4	3	1	1	1	57
45-OK-245	1	3.9	541	10	7	0	3	0	561
45-OK-246	1	3.9	1	0	7	0	0	0	8
45-OK-247	1	0.8	15	0	0	0	0	1	16
	2	1.8	18	5	0	0	0	0	23
45-OK-248	1	4.5	5	1	6	1	0	0	13
	2	4.3	21	6	56	1	1	0	85
45-OK-250	1	1.0	6	0	3	0	0	0	9
	2	5.0	57	56	30	1	0	1	145
	3	2.7	34	25	24	0	5	2	90
	4	1.4	97	19	4	0	0	1	121
45-OK-253	1	4.2	13	6	11	1	1	0	32
	2	1.8	3	2	0	0	0	0	5
45-OK-254	1	4.4	17	2	3	0	0	2	24
	2	5.2	14	3	19	2	1	2	41
45-OK-255	1	8.2	48	1	8	0	0	0	57
	2	6.2	11	9	6	0	0	0	26
45-OK-256	1	1.5	20	6	18	1	1	0	46
	2	2.5	8	6	3	1	0	0	18
45-OK-257	1	10.8	233	52	84	3	0	3	375
	2	5.0	83	15	22	1	0	0	121
45-OK-258	1	1.3	5	0	0	0	0	1	6
	2	3.8	41	8	37	1	4	0	91
	3	6.3	62	28	36	2	3	0	131
	4	1.2	14	15	13	0	0	0	42
45-OK-259	1	1.2	4	1	0	0	0	0	5
45-OK-261	1	1.2	0	0	2	1	1	5	9
	2	1.9	1	1	2	6	0	6	16
45-OK-264	1	5.2	3	1	1	0	0	0	5
	2	1.0	0	0	0	0	0	0	0
45-OK-265	1	10.7	22	3	7	0	0	5	37
45-OK-274	1	0.7	1	0	1	0	0	0	2
	2	1.5	30	21	8	1	1	0	61
	3	1.3	80	39	19	6	0	0	144
45-OK-275	1	7.0	202	11	30	2	2	1	248
	2	9.1	166	13	29	8	4	1	221
	3	2.7	19	9	12	2	0	0	42

Table 7.3 (Continued)

Site	Comp. #	Excav. Vol.(m^3)	Material Type Jasper	Chalced.	Quartzite	Basalt	Granite	Argillite	Total
45-OK-280	1	2.4	6	7	6	0	0	1	20
	2	10.8	37	16	8	2	4	5	72
	3	8.3	49	27	18	2	2	10	108
45-OK-287	1	2.1	12	4	7	0	3	0	26
45-OK-288	1	2.5	12	2	13	0	1	0	28
	2	2.0	12	3	26	1	0	0	42
	3	1.9	3	0	1	0	0	0	4
45-OK-289	1	3.6	2	2	0	0	0	0	4
45-OK-292	1	0.9	0	0	1	0	0	0	1
	2	3.8	131	26	32	2	7	1	199
	3	2.2	25	5	4	0	0	0	34
45-OK-303	1	4.6	4	1	0	1	0	1	7
45-OK-309	1	3.0	149	72	10	4	4	14	253
	2	4.8	7	6	1	1	0	0	15
45-OK-310	1	2.8	1	2	0	4	0	1	8
	8	0.0	1	3	0	2	0	0	6
45-OK-311	1	9.1	11	1	3	4	0	0	19
45-OK-312	1	3.8	2	1	0	1	0	1	5
	2	1.0	8	0	0	4	0	0	12
45-OK-313	1	1.8	3	0	0	1	0	0	4
	2	1.1	3	10	1	0	0	0	14
	8	0.0	3	1	2	4	2	0	12
45-OK-314	1	1.8	3	1	0	0	0	0	4
45-OK-340	1	4.4	5	2	0	0	0	0	7
45-OK-347	1	11.5	20	11	11	2	0	2	46
	2	6.2	14	7	2	1	0	4	28
Total Count		550.2	8,555	2,000	1,907	193	124	364	13,143
Density[1]			15.5	3.6	3.5	0.4	0.2	0.7	23.9

[1] Count per cubic meter

Table 7.4
Distribution of Lithic Object Types by Tested Site Component

Site	Comp. #	Excav. Vol.(m^3)	OBJECT TYPE Flake	Chunk	Core	Blade	Unmod. Object	Tabular Flake	Formed Object	Total
45-DO-102	1	5.7	36	4	0	2	0	8	2	52
45-DO-188	1	2.8	16	0	0	0	0	0	0	16
	2	1.9	129	8	0	2	0	2	1	142
45-DO-198	1	8.5	61	1	0	3	0	0	1	66
	2	8.2	36	3	0	0	0	3	1	43
45-DO-204	1	3.9	95	4	2	1	2	19	7	130
	2	2.4	43	3	0	1	1	8	4	60
	3	5.0	19	1	0	2	0	1	2	25
45-DO-211	1	5.1	74	19	0	0	0	32	3	128
	2	3.0	70	7	0	0	0	58	4	139
	3	2.9	55	8	0	0	0	15	1	79
45-DO-213	1	0.7	4	0	0	0	0	1	0	5
	2	2.8	14	2	0	0	0	8	0	24
45-DO-214	1	1.0	31	5	0	0	0	14	1	51
	2	7.1	270	25	1	0	0	14	26	336
45-DO-215	1	2.5	3	1	0	0	0	4	0	8
	2	3.5	26	1	0	1	0	56	2	86
45-DO-220	1	3.7	15	1	0	0	0	1	0	17
	2	1.9	4	0	0	0	0	2	2	8
45-DO-221	1	7.0	4	1	0	1	0	0	1	7
45-DO-222	1	2.0	18	0	0	0	0	1	1	20
	2	2.3	0	0	0	0	0	0	1	1
45-DO-233	1	4.5	25	2	0	0	0	1	0	28
45-DO-234	1	3.3	3	0	0	0	0	0	0	3
	2	2.3	0	0	0	0	0	0	0	0
45-DO-242	1	2.0	10	1	0	0	1	1	1	14
	2	3.9	39	3	0	0	0	4	5	51
	3	3.1	14	1	0	0	0	5	1	21
45-DO-243	1	2.4	20	4	0	0	0	4	1	29
	2	2.8	37	1	0	0	0	5	5	48
45-DO-248	1	3.8	49	5	0	0	0	0	5	59
45-DO-254	1	2.2	4	0	0	0	1	14	1	20
	2	2.8	7	9	0	0	0	8	1	25
	3	2.0	15	6	0	0	0	4	1	26
45-DO-262	1	4.5	7	3	0	0	1	17	1	29
45-DO-265	1	5.2	2	3	0	0	0	1	0	6
45-DO-273	1	0.8	6	0	0	0	0	0	2	8
	2	1.4	17	4	0	0	0	1	1	23
	3	3.5	22	2	0	0	0	3	0	27
45-DO-276	1	5.1	131	12	2	4	1	40	14	204
45-DO-282	1	4.2	37	5	0	0	0	0	0	42
	2	4.8	242	4	1	14	0	5	1	267
	3	5.4	369	19	0	22	0	5	4	419
	4	6.5	274	13	1	6	0	5	6	305
45-DO-284	1	6.7	21	0	0	1	1	11	1	35
45-DO-285	1	2.5	1,203	118	2	8	5	56	37	1,429
	2	2.4	109	13	0	1	1	8	2	134
45-DO-312	1	3.4	21	2	0	0	0	1	0	24
	2	1.8	12	0	0	0	0	0	0	12
45-DO-325	1	2.3	489	31	2	45	0	56	21	644
45-OK-2A	1	5.2	8	1	0	0	1	2	2	14
	2	15.2	98	4	0	0	5	10	5	122
45-OK-11	1	24.0	135	20	0	1	11	148	19	334
	2	17.5	325	34	1	0	4	151	25	540

Table 7.4 (Continued)

Site	Comp. #	Excav. Vol.(m^3)	OBJECT TYPE Flake	Chunk	Core	Blade	Unmod. Object	Tabular Flake	Formed Object	Total
45-OK-12	1	3.8	1	0	0	0	0	0	0	1
	2	1.6	14	2	0	1	0	0	0	17
	3	1.8	8	3	0	0	0	6	3	20
45-OK-18	1	2.5	18	4	0	0	0	4	0	26
	2	2.6	29	8	0	5	0	8	2	52
45-OK-20	1	17.8	631	79	1	5	8	41	43	808
45-OK-28	1	3.0	0	0	0	0	0	0	0	0
45-OK-158	1	4.5	33	5	0	0	5	13	12	68
45-OK-168	1	3.0	100	19	1	0	1	31	9	161
	2	2.2	24	5	0	0	0	5	5	39
45-OK-226	1	1.0	12	1	0	0	0	0	0	13
	2	2.6	138	3	1	2	1	5	1	151
45-OK-229	1	8.9	55	4	1	0	1	14	6	81
45-OK-239	1	8.9	876	47	3	5	8	51	36	1,026
	2	9.4	307	31	2	2	6	29	17	394
45-OK-244	1	1.2	63	1	1	0	0	2	0	67
	2	2.4	46	2	0	0	0	4	4	56
45-OK-245	1	3.9	524	23	0	1	2	6	4	560
45-OK-246	1	3.9	3	0	0	0	0	6	0	9
45-OK-247	1	0.8	18	0	0	0	0	0	0	18
	2	1.8	20	1	0	2	0	0	1	24
45-OK-248	1	4.5	7	0	0	0	0	5	2	14
	2	4.3	24	2	0	0	2	52	4	84
45-OK-250	1	1.0	5	0	0	0	0	3	1	9
	2	5.0	104	13	0	0	0	29	5	151
	3	2.7	58	8	0	0	3	21	3	93
	4	1.4	84	16	1	0	0	4	17	122
45-OK-253	1	4.2	16	3	0	1	0	10	3	33
	2	1.8	4	1	0	0	0	0	1	6
45-OK-254	1	4.4	13	3	2	0	0	4	3	25
	2	5.2	23	2	0	1	1	18	1	46
45-OK-255	1	8.2	42	4	2	0	0	7	2	57
	2	6.2	10	3	0	1	0	6	5	25
45-OK-256	1	1.5	10	3	0	0	0	30	4	47
	2	2.5	11	2	0	0	0	3	1	17
45-OK-257	1	10.8	252	28	3	0	4	82	12	381
	2	5.0	84	8	1	0	0	23	4	120
45-OK-258	1	1.3	4	0	0	0	0	0	2	6
	2	3.8	39	5	0	2	2	35	9	92
	3	6.3	67	7	3	1	2	49	2	131
	4	1.2	21	5	0	0	0	13	3	42
45-OK-259	1	1.2	3	0	0	0	0	0	1	4
45-OK-261	1	1.2	5	1	0	0	1	2	0	9
	2	1.9	15	1	0	0	0	0	1	17
45-OK-264	1	5.2	2	1	0	0	0	1	2	6
	2	1.0	0	0	0	0	0	0	0	0
45-OK-265	1	10.7	20	4	0	0	1	4	8	37
45-OK-274	1	0.7	1	0	0	0	0	1	0	2
	2	1.5	38	9	0	0	0	9	4	60
	3	1.3	79	26	2	2	0	18	18	145
45-OK-275	1	7.0	176	23	9	1	4	22	15	250
	2	9.1	163	17	1	0	9	28	10	228
	3	2.7	26	3	0	1	1	7	7	45

Table 7.4 (Continued)

Site	Comp. #	Excav. Vol.(m^3)	Flake	Chunk	Core	Blade	Unmod. Object	Tabular Flake	Formed Object	Total
			OBJECT TYPE							
45-OK-280	1	2.4	15	2	0	0	0	1	2	20
	2	10.8	56	2	1	4	3	2	6	74
	3	8.3	87	11	2	2	0	7	4	113
45-OK-287	1	2.1	12	6	1	0	0	6	1	26
45-OK-288	1	2.5	14	2	0	0	1	10	2	29
	2	2.0	17	1	0	1	1	20	2	42
	3	1.9	2	0	0	0	0	1	0	3
45-OK-289	1	3.6	3	0	0	0	0	0	0	3
45-OK-292	1	0.9	0	0	0	0	0	1	0	1
	2	3.8	130	19	1	1	7	24	19	201
	3	2.2	29	3	0	0	0	3	1	36
45-OK-303	1	4.6	4	1	0	0	0	0	3	8
45-OK-309	1	3.0	239	18	0	0	2	3	3	265
	2	4.8	13	1	0	0	1	0	1	16
45-OK-310	1	2.8	5	0	0	1	0	0	2	8
	8	0.0	5	0	0	0	0	0	1	6
45-OK-311	1	9.1	10	4	0	0	4	1	0	19
45-OK-312	1	3.8	4	2	0	0	0	0	0	6
	2	1.0	8	5	0	0	0	0	0	13
45-OK-313	1	1.8	6	0	0	0	1	0	0	7
	2	1.1	11	0	1	0	0	1	3	16
	8	0.0	9	2	0	0	1	1	0	13
45-OK-314	1	1.8	4	0	0	0	0	0	0	4
45-OK-340	1	4.4	5	2	0	0	0	0	0	7
45-OK-347	1	11.5	41	4	0	0	0	2	0	47
	2	6.2	23	1	0	0	0	2	1	27
Total Count		550.2	9,852	936	52	157	118	1,609	566	13,290
Density[1]			17.9	1.7	0.1	0.3	0.2	2.9	1.0	24.2

[1] Count per cubic meter

Table 7.5
Distribution of Selected Functional Classes by Tested Site Component[1]

Site	Comp. #	Tool Class 12113	12123	12133	12213	12223	12233	21111	21121	21131	38143	Pointed Wear[2]	Total
45-DO-102	1	1	1	0	0	0	0	0	1	1	0	0	4
45-DO-188	1	0	1	0	0	0	0	0	0	0	0	0	1
	2	4	0	0	1	0	0	1	1	0	0	1	8
45-DO-198	1	0	0	0	0	0	0	0	1	0	0	1	2
	2	1	0	1	0	0	0	1	0	0	0	3	6
45-DO-204	1	2	0	1	0	1	2	0	1	0	0	0	7
	2	1	0	1	0	0	0	1	0	0	4	0	7
	3	0	0	0	0	0	0	1	0	1	0	0	2
45-DO-211	1	1	3	1	1	0	0	1	0	0	0	0	7
	2	4	3	1	5	1	1	1	0	0	0	1	17
	3	2	0	0	0	0	0	0	0	0	0	0	2
45-DO-213	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	1	0	1	0	0	0	1	0	0	0	3
45-DO-214	1	1	2	3	0	0	0	0	1	1	0	0	8
	2	8	7	3	3	7	3	2	1	0	0	2	36
45-DO-215	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	1	0	0	2	0	2	0	0	5
45-DO-220	1	3	0	0	1	0	0	0	0	0	0	0	4
	2	0	0	0	0	0	0	0	0	0	0	0	0
45-DO-221	1	0	1	1	0	0	0	0	0	0	0	0	2
45-DO-222	1	5	1	0	3	0	0	1	0	0	0	0	10
	2	0	0	0	0	0	0	0	0	0	0	0	0
45-DO-233	1	2	1	0	0	1	0	0	0	0	0	0	4
45-DO-234	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0
45-DO-242	1	0	0	0	0	0	0	0	1	0	0	0	1
	2	5	2	2	6	0	0	0	0	1	0	0	16
	3	0	1	0	1	0	0	0	0	0	0	2	4
45-DO-243	1	1	1	1	0	0	0	0	0	0	0	0	3
	2	3	0	0	0	0	0	0	0	0	0	0	3
45-DO-248	1	5	3	0	0	1	0	0	0	0	0	0	9
45-DO-254	1	1	1	0	1	2	1	4	0	0	4	0	14
	2	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	2	0	1	0	0	0	0	1	4
45-DO-262	1	1	1	0	0	0	0	1	0	1	1	0	5
45-DO-265	1	1	0	0	0	0	0	0	0	0	0	0	1
45-DO-273	1	1	0	0	0	0	0	0	0	0	0	0	1
	2	1	0	0	0	1	0	0	0	0	0	1	3
	3	0	1	0	0	0	0	1	0	0	0	0	2
45-DO-276	1	4	2	3	2	1	0	2	0	0	1	1	16
45-DO-282	1	3	0	0	2	0	0	0	0	0	0	0	5
	2	11	3	0	5	1	1	1	0	0	0	4	26
	3	6	1	0	5	2	1	0	0	0	0	4	19
	4	10	1	1	4	1	0	0	1	0	0	1	19
45-DO-284	1	1	0	4	0	0	0	0	0	0	2	0	7
45-DO-285	1	16	7	6	7	7	7	1	0	2	8	1	62
	2	0	1	0	0	0	0	1	0	0	1	0	3
45-DO-312	1	1	1	0	0	0	0	0	0	0	0	0	2
	2	0	1	0	0	0	0	0	0	0	0	0	1
45-DO-325[a]	1	--	--	--	--	--	--	--	--	--	--	--	--
45-OK-2A	1	0	0	0	0	0	0	0	0	0	0	1	1
	2	3	1	1	6	2	0	1	4	0	2	2	22
45-OK-11	1	4	4	2	0	2	0	4	1	0	2	0	19
	2	6	5	0	1	0	0	1	6	0	6	2	27

Table 7.5 (Continued)

Site	Comp. #	Tool Class 12113	12123	12133	12213	12223	12233	21111	21121	21131	38143	Pointed Wear[2]	Total
45-OK-12	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	1	0	1	0	0	0	0	2
	3	1	0	0	1	0	0	0	1	0	0	0	3
45-OK-18	1	0	0	0	3	0	0	0	0	0	0	0	3
	2	2	0	0	2	0	0	0	0	0	0	0	4
45-OK-20	1	23	9	6	10	4	5	0	0	0	5	0	62
45-OK-28	1	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-158	1	4	2	1	2	1	0	3	0	2	1	1	17
45-OK-168	1	4	4	8	5	1	0	5	3	2	0	0	32
	2	0	2	1	0	0	0	0	0	0	0	1	4
45-OK-226	1	1	0	0	0	0	0	0	0	0	0	1	2
	2	7	0	1	5	0	1	0	1	0	1	0	16
45-OK-229	1	1	2	1	0	0	0	1	0	1	0	0	6
45-OK-239	1	20	5	12	2	3	3	1	2	6	1	1	56
	2	6	4	2	3	2	1	0	3	3	6	1	31
45-OK-244	1	3	0	0	1	0	0	0	1	0	0	0	5
	2	3	1	1	1	0	1	1	0	0	0	0	8
45-OK-245	1	5	4	0	2	2	0	2	1	0	1	0	17
45-OK-246	1	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-247	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	3	0	0	3	1	0	0	0	0	0	1	8
45-OK-248	1	1	1	0	1	0	0	0	1	0	0	0	4
	2	1	1	2	0	0	0	1	0	1	2	0	8
45-OK-250	1	0	0	0	2	0	0	0	0	0	0	0	2
	2	4	0	1	0	0	0	0	0	0	0	0	5
	3	4	0	0	0	0	0	0	1	0	3	2	10
	4	11	8	1	2	2	1	1	0	0	0	2	28
45-OK-253	1	2	1	0	0	0	0	0	0	0	1	0	4
	2	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-254	1	0	1	0	0	0	0	0	0	0	0	0	1
	2	0	0	0	0	0	0	1	1	2	0	0	4
45-OK-255	1	0	4	0	0	0	1	0	1	0	0	0	6
	2	1	0	1	0	1	0	1	0	0	0	0	4
45-OK-256	1	2	0	3	0	1	0	0	1	2	0	0	9
	2	1	0	1	0	0	0	0	0	0	0	0	2
45-OK-257	1	7	4	1	3	0	0	2	0	0	2	0	19
	2	4	4	3	4	1	0	3	2	1	2	0	24
45-OK-258	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	1	0	0	0	0	0	0	2	0	3	0	6
	3	2	0	0	0	0	0	1	0	2	0	1	6
	4	2	0	0	1	0	0	0	0	0	0	1	4
45-OK-259	1	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-261	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-264	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-265	1	1	2	1	1	1	0	0	1	0	0	0	7
45-OK-274	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	2	1	1	0	2	0	1	3	0	0	0	10
	3	3	2	2	1	1	2	2	0	0	0	4	17
45-OK-275	1	3	8	2	2	1	0	4	2	3	1	2	28
	2	2	1	0	0	0	0	2	2	0	3	2	12
	3	1	1	0	1	0	0	3	0	0	0	1	7

Table 7.5 (Continued)

Site	Comp. #	Tool Class 12113	12123	12133	12213	12223	12233	21111	21121	21131	38143	Pointed Wear[2]	Total
45-OK-280	1	0	1	1	0	0	0	0	1	0	0	0	3
	2	0	1	5	3	0	3	2	0	0	0	0	14
	3	1	1	3	0	0	0	1	1	1	0	0	8
45-OK-287	1	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-288	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-289	1	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-292	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	5	7	4	0	2	1	1	3	1	0	0	24
	3	0	2	6	0	0	0	0	0	0	0	0	8
45-OK-303	1	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-309	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-310	1	0	0	0	0	0	0	0	0	4	0	0	4
	8	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-311	1	0	0	0	0	0	0	1	1	0	0	0	2
45-OK-312	1	0	1	1	0	0	0	0	1	0	0	0	3
	2	0	0	0	0	0	0	1	0	0	0	0	1
45-OK-313	1	1	0	0	1	0	0	0	0	0	0	0	2
	2	0	0	0	0	0	0	0	0	0	1	0	1
	8	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-314	1	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-340	1	0	0	0	0	0	0	0	0	0	0	0	0
45-OK-347	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0
Total Count		264	143	104	120	57	36	70	56	40	64	49	1,003
Density[3]		0.48	0.26	0.19	0.22	0.10	0.07	0.13	0.10	0.07	0.12	0.09	1.82

[1] Note: This tabulation includes only those functional classes containing more than 30 specimens
[2] Pointed Wear = Series $1[4 \cup 5 \cup 6 \cup 7]000$
[3] Count per cubic meter
[a] Not classified

Table 7.6
Radiocarbon Age Determination on Carbonized Wood Samples

Site	Component	Laboratory Number	Uncorrected Age (years B.P.)[1]	Dendrocorrected Age (years B.P.)[2]	Provenience (Unit/Level/Feature)[3]
45-DO-102	1	Tx-2895	680±50	692±58	56N•20E/40
45-DO-102	1	Tx-3058	470±50	500±63	26N•21E/40
45-DO-204	2	Tx-2896	2660±340	2812±344	3N•50W/70/Fea. 2
45-DO-204	3	Tx-2897	570±60	592±71	5N•21W/40/Fea. 1
45-DO-214	2	Tx-2898	1170±160	1151±168	50N•27E/110/Fea. 1
45-DO-242	3	Tx-3131	730±60	738±67	T.P. 2/20
45-DO-276	1	Tx-3133	620±150	638±153	T.P. 1/20
45-DO-276	1	Tx-3134	750±50	756±58	T.P. 1/40
45-DO-285	1	Tx-3051	1690±950	1680±950	15N•34W/110
45-OK-11	2	Tx-2899	3240±520	3557±523	54N•72E/50/Fea. 1
45-OK-11	1	Tx-3059	3480±410	3872±412	24N•67E/80
45-OK-18	1	Tx-3051	3410±170	3780±175	10S•8E/70
45-OK-20	1	Tx-2901	1570±70	1553±75	17N•43W/80/Fea. 2
45-OK-158	1	Tx-2902	990±80	979±86	52N•24W/50
45-OK-158	1	Tx-3061	780±60	783±67	52N•24W/30
45-OK-158[a]	---	Tx-3060	2280±40	2348±108	34N•25W/110
45-OK-226	2	Tx-3125	270±90	too recent	T.P. 1/20
45-OK-239	1	Tx-2903	2260±130	2324±162	15N•65W/110/H.P. 5
45-OK-239	2	Tx-2904	520±300	547±302	30N•116W/130
45-OK-248	1	Tx-3126	3900±170	4422±194	T.P. 2/90
45-OK-250	2	Tx-3127	2370±240	2456±262	T.P. 2/150
45-OK-255	1	Tx-3124	2880±50	3091±58	T.P. 3/190
45-OK-257	1	Tx-3128	3470±580	3859±582	T.P. 1/70
45-OK-257	1	Tx-3129	3480±510	3872±512	T.P. 2/140
45-OK-258	2	Tx-2905	2620±230	2763±235	3N•64W/170/Fea. 1
45-OK-258	2	Tx-2906	2850±230	3054±232	0S•97W/110
45-OK-258	1	Tx-3063	3500±480	3899±491	0N•83W/50
45-OK-265	1	Tx-3053	700±50	710±58	36S•66W/30
45-OK-274	3	Tx-3054	880±90	876±95	34S•30E/20-30
45-OK-275	2	Tx-3055	500±250	529±253	133S•3E/60
45-OK-280	2	Tx-3056	3220±170	3532±179	28S•34E/80
45-OK-288	2	Tx-3130	930±70	923±77	T.P. 2/80-90
45-OK-292	2	Tx-2907	2760±200	2938±205	1S•29E/90
45-OK-310	1	Tx-3057	4830±80	5580±120	T.H. 1/55/Fea. 1
45-OK-311	1	Tx-2908	2730±360	2901±363	T.P. 1/45/Fea. 1

[1] Half-life = 5568 years
[2] Half-life = 5730 years (correction according to Damon et al. 1974)
[3] T.P. = test pit; T.H. = test hole
[a] Apparently dates naturally occurring charcoal

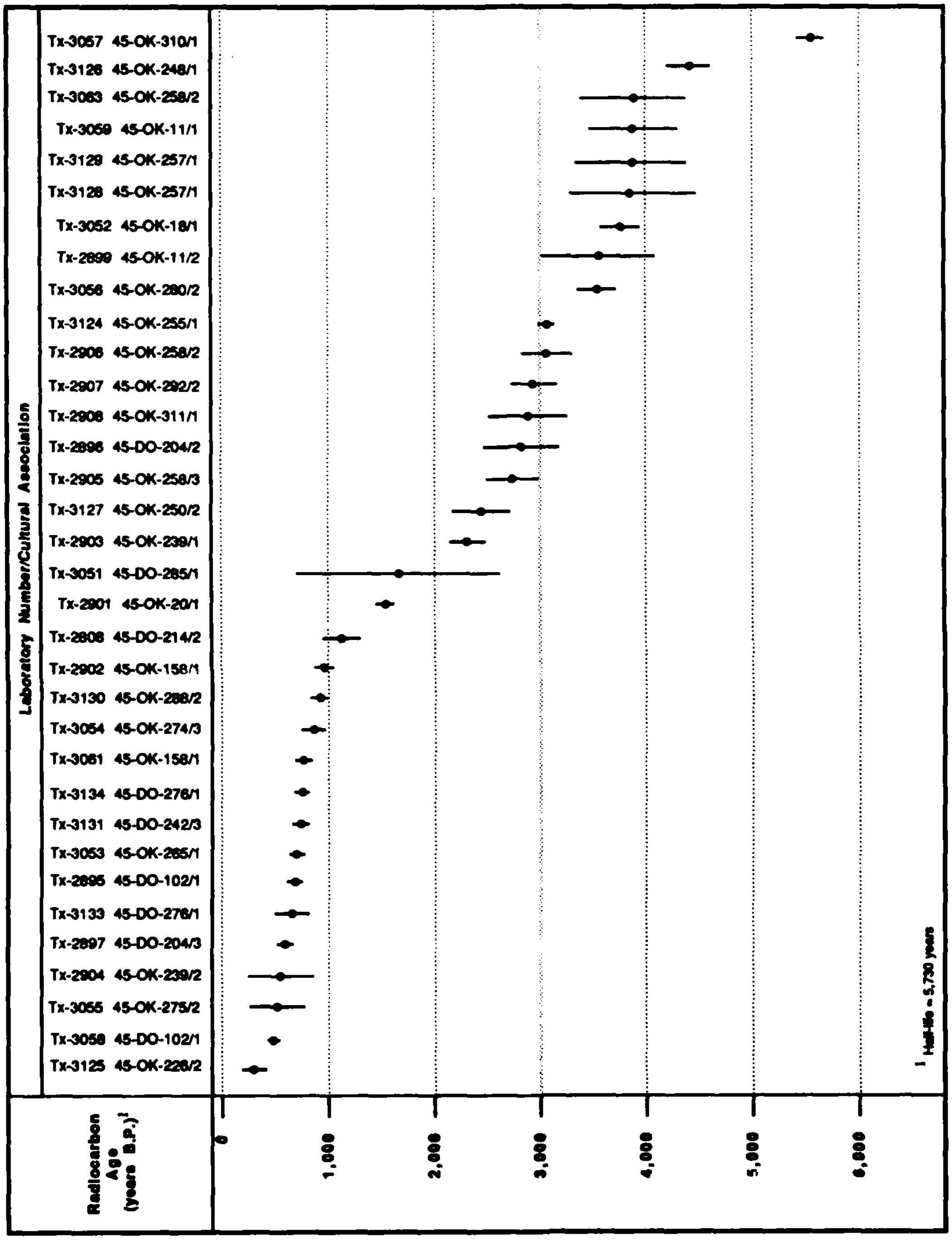

Figure 7.1. Distribution of means and 1-sigma ranges for radiocarbon age determinations.

using numerical taxonomy. The procedure itself is relatively simple and involves two general steps. First, we establish the temporal range of each projectile point class based on associations with occupation components already dated by radiocarbon age determinations. Finally, we make temporal assignments for previously undated components based on the occurrence of associated relatively dated projectile point classes.

Figure 7.2 plots the temporal ranges of all projectile point clusters for which we have associated radiocarbon age determinations; this same information also is included with the cluster descriptions in Appendix B. In several cases, the same radiocarbon age determination is associated with more than one point cluster. In other cases, point clusters are associated with the same radiocarbon samples and are lumped together. For example, Stemmed Clusters 3 and 10 are associated with the same three radiocarbon age determinations, and I plot their temporal distribution on a single time line. Four point types (Stemmed Cluster 12 and Unstemmed Clusters C, F, and H) are not associated with radiocarbon samples and thus do not appear in this portrayal. Unstemmed Cluster B includes several specimens that may be preforms -- "unfinished" projectile points. Although most of these are associated with relatively early radiocarbon dates, one specimen occurs with a very recent date. I have chosen to ignor the more recent age determination and lump this cluster with Unstemmed Clusters K and I, which are associated with the same early radiocarbon ages. Finally, Unstemmed Cluster H, although not associated with any age-determined organic sample, is found at 45-DO-273 along with Mazama Ash, which is dated to approximately 6,700 B.P. in other areas. In addition, specimens included in this cluster are highly similar morphologically to the "Cascade-like", leaf-shaped points that Nelson (1969:151) attributes to the time range from 7,000 to 4,500 B.P., a period consistent with a Mazama Ash association. Consequently, I use this cluster as a temporal marker for this period.

We used the hypothesized temporal ranges for projectile point clusters depicted in Figure 7.2 to make chronological assignments for occupation components lacking associated radiocarbon age determinations. In all, 29 components may be dated in this manner. Taken together with the 28 components that have associated radiocarbon age determinations, 57 of 133 occupation components carry temporal assignments.

Table 7.7 summarizes the temporal attributes of all testing occupation components. In addition to itemizing all associated radiocarbon age determinations and projectile points, this tabulation lists hypothesized temporal assignments; both an age range and a mean age are given. Age ranges are derived by using the minimum and maximum 1-sigma values (rounded to the nearest 100 years) for any associated radiocarbon samples or relatively dated projectile points. For example, the age range of Component 1 at 45-DO-102, which is based on two associated radiocarbon age determinations of 500±63 B.P. (Tx-3058) and 692±58 B.P. (Tx-2895), is given as 800 - 400 B.P. Similarly, mean age assessments are derived by averaging the mean values of any associated radiocarbon age determinations and rounding this number to the nearest 100 years. Where both dated organic samples and projectile points occur with a component, radiocarbon age determinations take precedence over potential temporal assignments based on typological considerations.

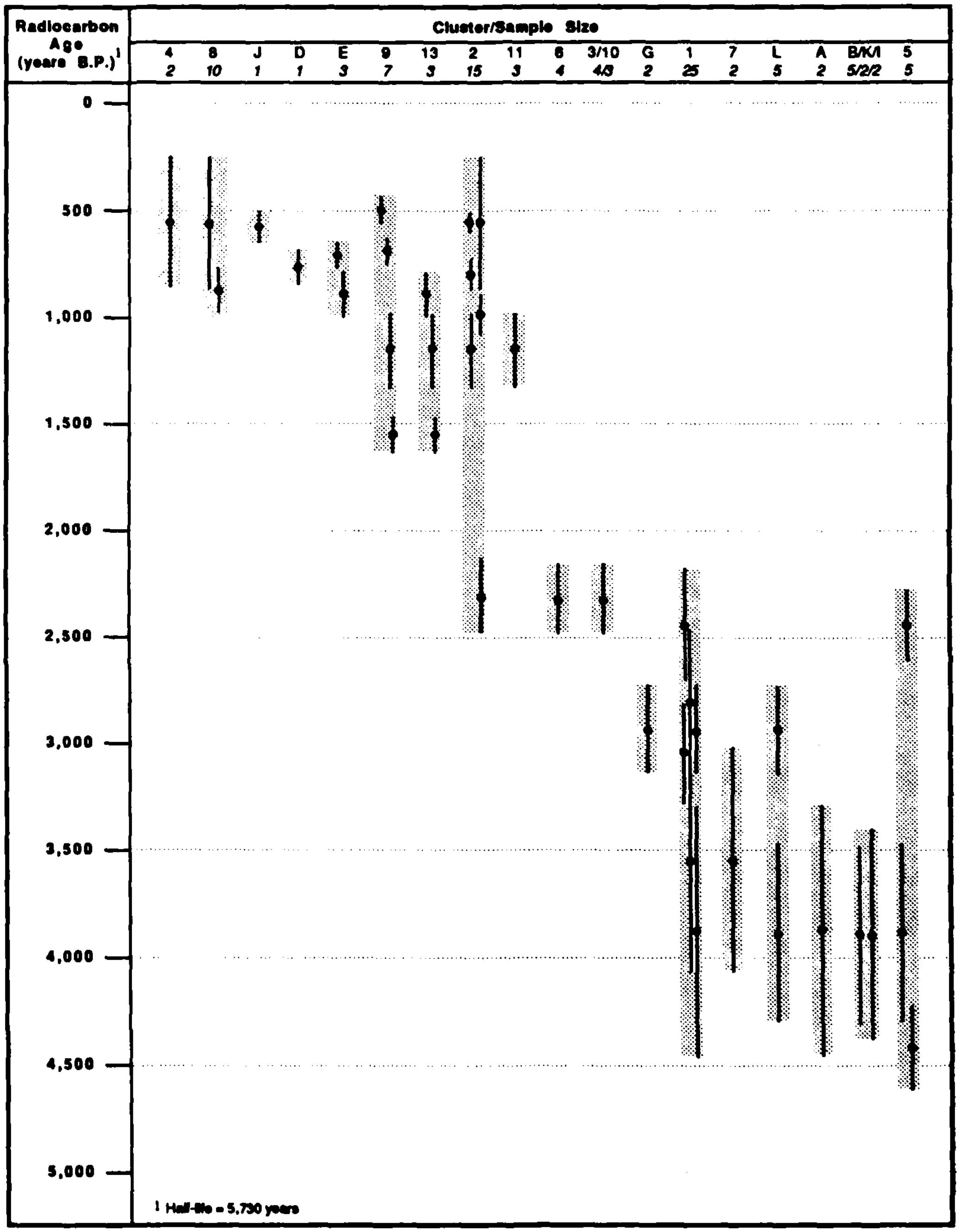

Figure 7.2. Temporal distribution of projectile point clusters based on associated radiocarbon age data.

Table 7.7
Summary of Occupation Component Temporal Attributes

Site	Component	Radiocarbon Ages[1] Lab #	Age (B.P.)	Projectile Points[1] (Specimen #/Cluster)	Temporal Assignment[2] Range	Mean
45-DO-102	1	Tx-3058	500±63	10/9	800 - 400	600
		Tx-2895	692±58			
45-DO-188	1	---	---	---	---	---
	2	---	---	---	---	---
45-DO-198	1	---	---	---	---	---
	2	---	---	---	---	---
45-DO-204	1	---	---	---	---	---
	2	Tx-2896	2812±344	16/1,40/1(beach)	3200 - 2500	2800
	3	Tx-2897	592±71	1/J	700 - 500	600
45-DO-211	1	---	---	---	---	---
	2	---	---	8/B	4400 - 3400	3900
	3	---	---	3/I	4400 - 3400	3900
45-DO-213	1	---	---	---	---	---
	2	---	---	---	---	---
45-DO-214	1	---	---	64/1	4400 - 2200	3100
	2	Tx-2898	1151±168	1/2,3/13,17/9,49/11	1300 - 1000	1200
45-DO-215	1	---	---	---	---	---
	2	---	---	---	---	---
45-DO-220	1	---	---	---	---	---
	2	---	---	1/B(surface)	---	---
45-DO-221	1	---	---	---	---	---
45-DO-222	1	---	---	9/2	2500 - 800	1100
	2	---	---	---	---	---
45-DO-233	1	---	---	---	---	---
45-DO-234	1	---	---	---	---	---
	2	---	---	---	---	---
45-DO-242	1	---	---	---	---	---
	2	---	---	---	---	---
	3	Tx-3131	738±67	---	800 - 700	700
45-DO-243	1	---	---	---	---	---
	2	---	---	7/1,2/3	4400 - 2200	2700
45-DO-248	1	---	---	---	---	---
45-DO-254	1	---	---	---	---	---
	2	---	---	63/2	2500 - 300	1100
	3[a]	---	---	---	---	---
45-DO-262	1	---	---	---	---	---
45-DO-265	1	---	---	---	---	---
45-DO-273	1	---	---	10/H	7000 - 4500	5800
	2	---	---	---	---	---
	3	---	---	---	---	---
45-DO-276	1	Tx-3133	638±153	16/B,3/C	800 - 500	700
		Tx-3134	756±58			
45-DO-282	1	---	---	---	---	---
	2	---	---	---	---	---
	3	---	---	---	---	---
	4	---	---	(106/H)	(7000 - 4500)	(5800)
45-DO-284	1	---	---	---	---	---
45-DO-285	1	Tx-3051	1680±950	18/6,40/6,33/11	2500 - 1000	1900
	2	---	---	---	---	---
45-DO-312	1	---	---	---	---	---
	2	---	---	---	---	---
45-DO-325	1	---	---	1/2,169/2,93/8,131/9	2500 - 300	< 1000
45-OK-2A	1	---	---	29/1,(36/8)	4400 - 2200	3100
	2	---	---	44/2(surface),43/9(surface)	2500 - 300	< 1000

Table 7.7 (Continued)

Site	Component	Radiocarbon Ages[1] Lab #	Age (B.P.)	Projectile Points[1] (Specimen #/Cluster)	Temporal Assignment[2] Range	Mean
45-OK-11	1	Tx-3059	3872±412	14/5,13/I,10/L	4300 - 3500	3900
	2	Tx-2899	3557±523	6/1,69/1,8/7,(55/F)	4100 - 3000	3600
45-OK-12	1	---	---	---	---	---
	2	---	---	---	---	---
	3	---	---	---	---	---
45-OK-18	1	Tx-3052	3780±175	---	4000 - 3600	3800
	2	---	---	1/1(surface),(10/1)	4400 - 2200	3100
45-OK-20	1	Tx-2901	1553±75	73/2,85/2,95/2,30/9,50/9,69/13	1600 - 1500	1600
45-OK-28	1	---	---	---	---	---
45-OK-158	1	Tx-3061	783±67	4/2	1100 - 700	900
		Tx-2902	979±86			
45-OK-168	1	---	---	16/1,41/1	4400 - 2200	3100
	2	---	---	(32/L)	---	---
45-OK-226	1	---	---	---	---	---
	2	Tx-3125	278±90	---	400 - 200	300
45-OK-229	1	---	---	12/9	1600 - 400	< 1000
45-OK-239	1	Tx-2903	2324±162	87/3,64/6,99/11,100/10	2500 - 2200	2300
	2	Tx-2904	547±302	158/2,125/4,237/6,130/8	800 - 200	500
45-OK-244	1	---	---	---	---	---
	2	---	---	25/5	4600 - 2300	3600
45-OK-245	1	---	---	---	---	---
45-OK-246	1	---	---	---	---	---
45-OK-247	1	---	---	---	---	---
	2	---	---	---	---	---
45-OK-248	1	Tx-3126	4422±194	4/5	4600 - 4200	4400
	2	---	---	6/1,10/1	4400 - 2200	3100
45-OK-250	1	---	---	3/H(beach),(111/L)	7000 - 4500	5800
	2	Tx-3127	2456±262	35/1,40/1,110/1,2/1(beach)	2700 - 2200	2500
	3	---	---	4/3(beach),1/10(beach)	2500 - 2200	2300
	4	---	---	92/8,95/8,100/8,48/A	1000 - 300	700
45-OK-253	1	---	---	11/K	4400 - 3400	3900
	2	---	---	---	---	---
45-OK-254	1	---	---	---	---	---
	2	---	---	11/E	1000 - 700	800
45-OK-255	1	Tx-3124	3091±58	---	3100 - 3000	3100
	2	---	---	---	---	---
45-OK-256	1	---	---	---	---	---
	2	---	---	---	---	---
45-OK-257	1	Tx-3128	3859±582	16/1,64/1,24/A	4400 - 3300	3900
		Tx-3129	3872±512			
	2	---	---	42/8	1000 - 300	700
45-OK-258	1	(Tx-3063)[a]	(3899±491)	35/K	4400 - 3400	3900
	2	Tx-2905	2763±235	36/1,34/B	3300 - 2500	2900
		Tx-2906	3054±232			
	3	---	---	---	---	---
	4	---	---	---	---	---
45-OK-259	1	---	---	---	---	---
45-OK-261	1	---	---	---	---	---
	2	---	---	---	---	---
45-OK-264	1	---	---	---	---	---
	2	---	---	---	---	---
45-OK-265	1	Tx-3053	710±58	1/D,8/E	800 - 700	700
45-OK-274	1	---	---	---	---	---
	2	---	---	61/2	2500 - 300	1100
	3	Tx-3054	876±95	6/8,8/8,5/13,3/E	1000 - 800	900

Table 7.7 (Continued)

Site	Component	Radiocarbon Ages[1]		Projectile Points[1]	Temporal Assignment[2]	
		Lab #	Age (B.P.)	(Specimen #/Cluster)	Range	Mean
45-OK-275	1	---	---	73/1,48/L	4400 - 2200	3300
	2	Tx-3055	529±253	(31/1)	800 - 300	500
	3	---	---	---	(79/1)	---
45-OK-280	1	---	---	---	---	---
	2	Tx-3056	3532±179	---	3700 - 3400	3500
	3	---	---	---	---	---
45-OK-287	1	---	---	3/8	1000 - 300	700
45-OK-288	1	---	---	5/G	3100 - 2700	2900
	2	Tx-3130	923±77	---	1000 - 800	900
	3	---	---	---	---	---
45-OK-289	1	---	---	---	---	---
45-OK-292	1	---	---	---	---	---
	2	Tx-2907	2938±205	26/1,30/1,40/G,39/L	3100 - 2700	2900
	3	---	---	44/2	2500 - 300	1100
45-OK-303	1	---	---	6/B	4400 - 3400	3900
45-OK-309	1	---	---	---	---	---
	2	---	---	---	---	---
45-OK-310	1	Tx-3057	5580±120	---	5700 - 5500	5600
	8	---	---	---	---	---
45-OK-311	1	Tx-2908	2901±363	---	3300 - 2500	2900
45-OK-312	1	---	---	---	---	---
	2	---	---	---	---	---
45-OK-313	1	---	---	---	---	---
	2	---	---	---	---	---
	8	---	---	---	---	---
45-OK-314	1	---	---	---	---	---
45-OK-340	1	---	---	---	---	---
45-OK-347	1	---	---	---	---	---
	2	---	---	---	---	---

[1] Doubtful associations indicated by parentheses; Half-life = 5730 years (corrected)
[2] Years B.P.
[a] Redeposited matrix

8. Temporal - Spatial Variability

The final phase in our analysis of testing data involves an examination and characterization of reservoir-wide temporal and geographic variability that could provide clues about the evolution of regional settlement - subsistence systems. Although the low sampling intensity we employed during the testing program precludes us from drawing any final conclusions about the prehistoric cultural record, available data are adequate for us to identify patterns that may have future research or management value.

The Dimension of Time

In the last chapter, we used both radiocarbon age determinations and associated projectile points to make tentative temporal assignments for 57 of the 133 recognized occupation components. The temporal distribution of dated components, however, is not uniform. Figure 8.1 plots the frequency of the mean ages of dated components within 1,000-year intervals. Nearly 65 percent of all components are attributable to two time periods. With the possible exception of the first

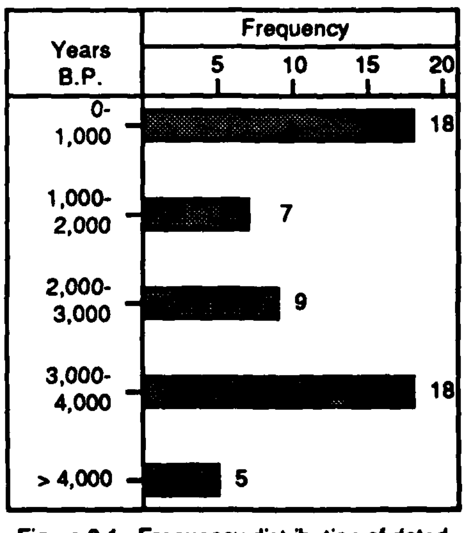

Figure 8.1. Frequency distribution of dated occupation components.

interval, sufficient representatives occur in each period, however, to warrant further analytic consideration; only five components occur in the earliest time period and only one of these assignments is based on a radiocarbon age determination. Consequently, in the following discussion, I confine my discussions to patterns that may occur across the other time periods.

Table 8.1 itemizes the temporal distribution of occupation components in terms of several general assemblage constituents, and Figure 8.2 portrays this same information in graphic terms. Based on the data, we can draw several tentative conclusions.

Table 8.1
Temporal Distribution of General Assemblage Constituents

Time Period	Material Category: Bone Wt. (g)	Shell #	FMR Wt.(g)	Lithics #
0 - 1,000	4,539	1,939	407,066	2,548
	46.1[a]	*19.7*	*4,136.8*	*25.9*
1,000 - 2,000	3,336	1,137	133,325	2,732
	92.9	*31.7*	*3,713.8*	*76.1*
2,000 - 3,000	2,517	1,489	98,774	1,723
	61.4	*36.3*	*2,409.1*	*42.0*
3,000 - 4,000	8,679	9,480	249,384	2,352
	75.3	*82.2*	*2,162.9*	*20.4*
> 4,000	207	190	1,279	345
	13.3	*12.2*	*82.0*	*22.1*
Total	19,278	14,235	889,828	9,700
	63.0	*46.5*	*2,906.0*	*31.7*

[a] Italics = density per cubic meter

In general, the density of faunal materials remains fairly high through time. The single major exception to this pattern is the latest temporal period, which is characterized by a relatively low density value. Given that most of the bone in the testing assemblage comes from large terrestrial mammals (e.g., deer, elk, antelope), it is reasonable to conclude that the observed pattern may reflect a shift in subsistence resources to fish and plant foods.

Shell density markedly decreases from the earliest period to the latest. The low value for the most

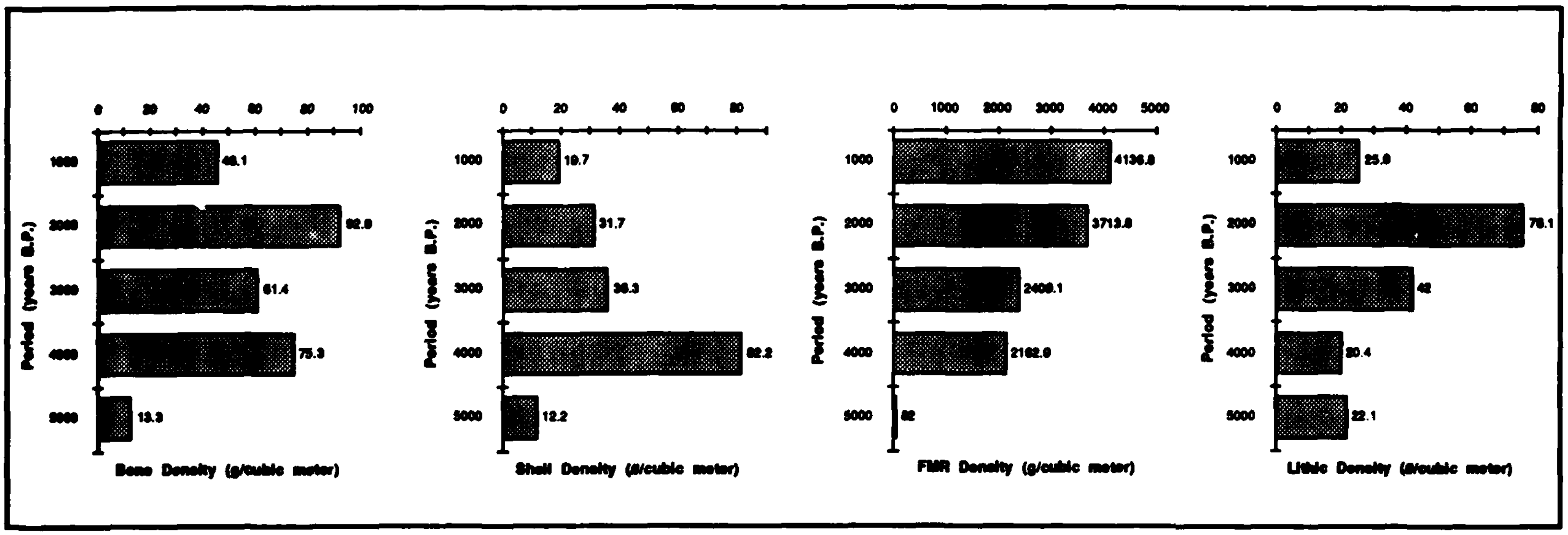

Figure 8.2. Temporal distribution of general assemblage constituents.

recent period accords well with ethnographic data that indicate local populations did not use freshwater mussel except in time of food shortages. It is obvious, however, that this was not always the case. Early inhabitants of the area appear to have made extensive use of this resource. Two explanations come immediately to mind. First, the decreasing number of shellfish simply may be due to changes in its environmental availability; human predation of this resource may have depleted resident populations to the point that they could no longer sustain a high level of of exploitation. On the other hand, decreasing shellfish use may reflect changing dietary preferences. Although available data are not adequate to resolve this matter with any degree of certainty, the observed pattern is so strong that the cultural explanation is the most reasonable.

The density of fire-modified rock (FMR) increases steadily through time. Again, the observed pattern is so strong that it cannot be dismissed simply on the basis of sampling vagaries. Instead, we hypothesize that it may be due to changes in the nature of domestic activites through time. Given that FMR are the product of heat-related activities, it is possible that increasing densities in this material category may be the result of increased reliance on fish and plant foods, whose processing typically involve the use of fire for drying or cooking.

Lithic density displays a more complicated temporal pattern than other general assemblage constituents. During most of the temporal sequence, lithic density increases, perhaps as a consequence of increasing use of locally available source materials. In the most recent period, however, lithic density decreases dramatically. Viewed in the context of the other patterns I have described, this change may be related to the apparent decreasing reliance on terrestrial mammals for food; procurement and processing of fish and plant foods do not require extensive use of lithic tools.

Table 8.2 lists the temporal distribution of major faunal categories. As can be seen from this display, only the category referred to as "large herbivores", which includes deer, elk, antelope, and other large terrestrial mammals, contains sufficient representatives to warrant further consideration Nevertheless, the observed pattern for this category underscores our earlier observation that local populations appear to have placed decreasing reliance on large game mammals through time; density values for the period 4,000 to 3,000 B.P. are more than three times as high as the most recent period.

Table 8.3 and Figure 8.3 provide baseline information about the temporal distributions of lithic material types. Although these portrayals suggest that, in general, resident lithic procurement strategies changed little through time, certain patterns do appear that may be of cultural significance. For example, the use of cryptocrystallines (particularly, jasper and chalcedony) and argillite tends to increase through time at the expense of coarser-grained materials. Although this pattern is in accord with similar observations made by researchers in other areas of the Columbia Plateau (cf., Kennedy 1976), we must also stress that current data indicate that cryptocrystallines appear to be the preferred lithic raw material throughout the cultural sequence.

Table 8.4 provides baseline data about changes in lithic object types as a function of time. This tabulation is of interest because it underscores the relatively stable character of the local lithic manufacturing system; flakes of one kind or another dominate through time, and cores always constitute less than one percent of the total assemblage.

Despite the relatively uniform nature of these distributions, both blades and tabular flakes appear to be temporally responsive. The density of blades remains stable during much of the sequence, but increases markedly during the most recent temporal period; however, most of these (45) come from a single occupation component at 45-DO-325. Tabular flakes tend to decrease in frequency through time. Almost all such specimens are manufactured of quartzite, a material type that also displays decreased popularity through time. Although I can offer no definitive explanation for this observed pattern, perhaps it is tied to the general decline in the exploitation of game mammals and shellfish noted earlier.

Table 8.5 lists changes in select tool class frequencies as a function of time. The most notable feature of this display is the relative temporal stability of all classes. Although differences occur, they do not appear to have temporal significance. Instead, explanations for the observed variability in this aspect of the material cultural assemblage must be sought elsewhere.

Table 8.2
Temporal Distribution of Major Faunal Categories

Time Period	Faunal Category				
	Large Herbivore	Small Herbivore	Carnivore	Fish	Turtle
0-	210	34	2	31	2
1,000	*2.1*[a]	*0.3*	*0.0*	*0.3*	*0.0*
1,000-	100	12	0	8	2
2,000	*2.8*	*0.3*	*0.0*	*0.2*	*0.1*
2,000-	169	0	4	17	3
3,000	*4.1*	*0.0*	*0.1*	*0.4*	*0.1*
3,000-	739	21	4	31	18
4,000	*6.4*	*0.2*	*0.0*	*0.3*	*0.2*
> 4,000	29	1	0	8	1
	1.9	*0.1*	*0.0*	*0.5*	*0.1*
Total	1247	68	10	95	26
	4.1	*0.2*	*0.0*	*0.3*	*0.1*

[a] Italics = density in NISP per cubic meter

Table 8.3
Temporal Distribution of Major Lithic Material Types

Time Period	Material Type						Total
	Jasper	Chalcedony	Quartzite	Basalt	Granite	Argillite	
0-	1,556	444	362	53	29	63	2,507
1,000	*62.1*[a]	*17.7*	*14.4*	*2.1*	*1.2*	*2.5*	
1,000-	1,989	356	165	12	14	167	2,703
2,000	*73.6*	*13.2*	*6.1*	*0.4*	*0.5*	*6.2*	
2,000-	1,161	233	233	23	26	21	1,697
3,000	*68.4*	*13.7*	*13.7*	*1.4*	*1.5*	*1.2*	
3,000-	1,359	160	686	49	29	37	2,320
4,000	*58.6*	*6.9*	*29.6*	*2.1*	*1.3*	*1.6*	
> 4,000	195	109	19	6	0	3	332
	58.7	*32.8*	*5.7*	*1.8*	*0.0*	*0.9*	
Total	6,260	1,302	1,465	143	98	291	9,559
	65.5	*13.6*	*15.3*	*1.5*	*1.0*	*3.0*	

[a] Italics = row percentages

Table 8.4
Temporal Distribution of Lithic Object Types

Time Period	Object Type							Total
	Flake	Chunk	Core	Blade	Unmod.	Tab.Flk	Formed	
0-1,000	1,802 *71.3*[a]	176 *7.0*	14 *0.6*	61 *2.4*	31 *1.2*	302 *11.9*	142 *5.6*	2,528
1,000-2,000	2,196 *80.9*	243 *9.0*	4 *0.1*	13 *0.5*	13 *0.5*	132 *4.9*	113 *4.2*	2,714
2,000-3,000	1,311 *76.3*	102 *5.9*	4 *0.2*	9 *0.5*	26 *1.5*	184 *10.7*	83 *4.8*	1,719
3,000-4,000	1,391 *59.3*	171 *7.3*	17 *0.7*	12 *0.5*	30 *1.3*	610 *26.0*	114 *4.9*	2,345
> 4,000	297 *86.3*	13 *3.8*	1 *0.3*	7 *2.0*	0 *0.0*	13 *3.8*	13 *3.8*	344
Total	6,997 *72.5*	705 *7.3*	40 *0.4*	102 *1.1*	100 *1.0*	1,241 *12.9*	465 *4.8*	9,650

[a] Italics = row percentages

Table 8.5
Temporal Distribution of Selected Tool Classes

Time Period	Tool Class											Total
	12113	12123	12133	12213	12223	12233	2111	21121	21131	38143	Point	
0-1,000	47 *22.4*[a]	30 *14.3*	16 *7.6*	27 *12.9*	11 *5.2*	5 *2.4*	17 *8.1*	15 *7.1*	11 *5.2*	16 *7.6*	15 *7.1*	210
1,000-2,000	54 *28.7*	27 *14.4*	22 *11.7*	23 *12.2*	20 *10.6*	15 *8.0*	5 *2.7*	4 *2.1*	2 *1.1*	13 *6.9*	3 *1.6*	188
2,000-3,000	38 *33.6*	12 *10.6*	18 *15.9*	2 *1.8*	5 *4.4*	4 *3.5*	4 *3.5*	9 *8.0*	7 *6.2*	11 *9.7*	3 *2.7*	113
3,000-4,000	39 *19.5*	38 *19.0*	25 *12.5*	25 *12.5*	5 *2.5*	6 *3.0*	21 *10.5*	14 *7.0*	7 *3.5*	14 *7.0*	6 *3.0*	200
> 4,000	12 *40.0*	2 *6.7*	1 *3.3*	7 *23.3*	1 *3.3*	0 *0.0*	0 *0.0*	2 *6.7*	4 *13.3*	0 *0.0*	1 *3.3*	30
Total	190 *25.6*	109 *14.7*	82 *11.1*	84 *11.3*	42 *5.7*	30 *4.0*	47 *6.3*	44 *5.9*	31 *4.2*	54 *7.3*	28 *3.8*	741

[a] Italics = row percentages

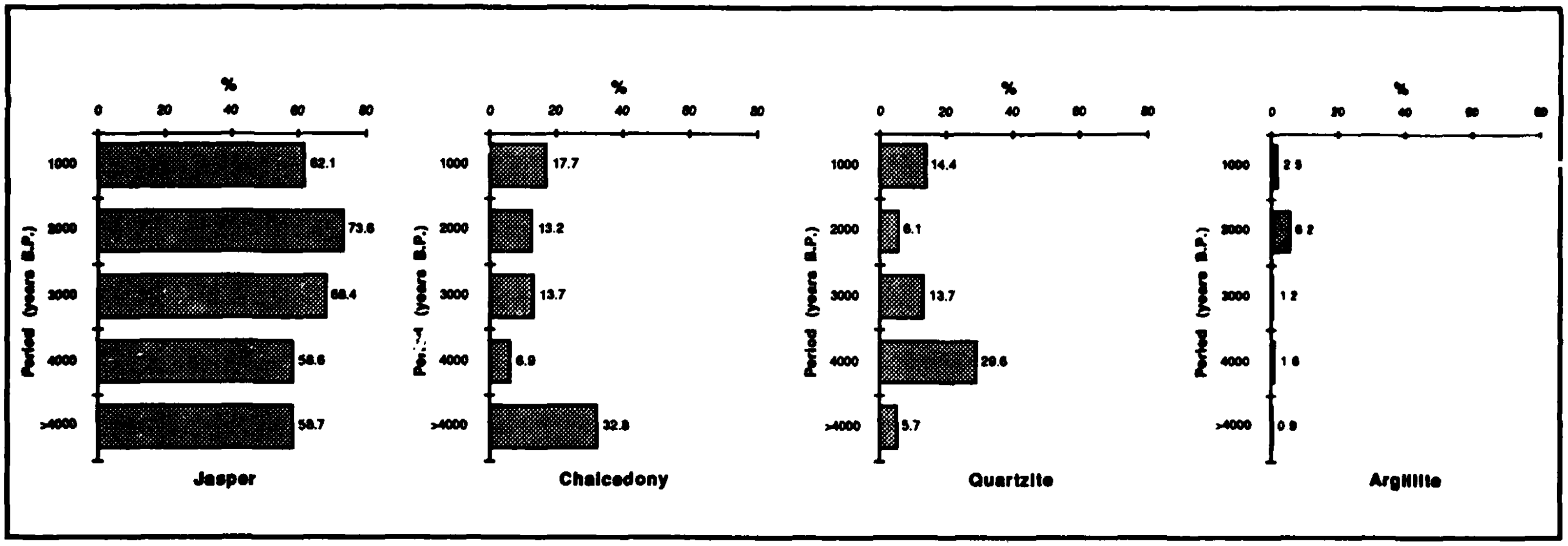

Figure 8.3 Frequency distributions of select lithic material types through time.

The Dimension of Space

In analyzing potential geographic variability among occupation components, we examined the data from two perspectives. The first involved a division into two sets depending upon which side of the river components occurred. On the basis of reconnaissance data, we had reason to believe that marked differences occur in the cultural record that are linked to local geography. For example, all but one site having surface depressions potentially attributable to prehistoric domestic features occur on the right (northern) side of the river (see Table 6.9). Given that most sites containing these features are considered to be "winter villages", two explanations for the observed distribution pattern seem to be involved:

- The right bank has substantially more level land near the river on which to site such structures; and
- The right bank receives substantially more sunlight during the winter months -- the south side of the river is markedly cooler during this season of the year.

Although important differences exist in the kinds of sites occurring on the two sides of the river, similar patterning is not evident in the contents of the material archaeological record. The frequency distributions of faunal taxa, lithics, and tool classes are remarkably similar from one side of the river to the other. Differences do occur, however, in the densities of general assemblage constituents (Table 8.6). Most notably, the amounts of bone and FMR are higher on the right bank of the river. This is likely due to differences in intensity of occupation -- the right bank exhibits much more intense, localized use, whereas the left bank includes many of the smaller, more diffuse sites. Where dense occupation components occur along the south bank of the river, they generally are found at the extreme upstream end of the reservoir, an area characterized by relatively broad terraces.

The second perspective we used in analyzing possible spatial variability involved distinctions based on the apparent geographic clustering of habitation sites along the river. An examination of the spatial dispersion of recorded habitation sites (Figure 5.3) suggests that several distinct concentrations of occupation loci occur. Because this patterning potentially could have important consequences for interpreting and managing the regional cultural record, we decided to examine this matter in greater detail.

Table 8.6
General Assemblage Constituents versus Side of River

Material Category	Side of River: Right	Side of River: Left	Total
Bone Weight	17,884	5,230	23,114
	48.3[a]	*29.1*	*42.0*
Shell Number	12,977	5,390	18,367
	35.0	*30.0*	*33.4*
FMR Weight	856,196	159,690	1,015,886
	2,310.9	*889.6*	*1847.1*
Lithics Number	7,970	5,403	13,373
	21.5	*30.1*	*24.3*

[a] Italics = density per cubic meter

For the purposes of this analysis, I subdivided the available occupation components into seven sets, or geographic clusters (Figures 8.4 and 8.5). Table 8.7 summarizes the general characteristics of each geographic cluster. With the exception of Box Canyon and Sanderson Creek, recognized clusters appear to include sufficient numbers of occupation components to warrant further, more detailed analysis.

Table 8.7
Sample Characteristics of Geographic Clusters

Cluster	Extent (RM)[1]	Sites #	Comp. #	Excav. Vol.(m^3)
Box Canyon	555-557	2	6	25.6
Gaviota Bend	558-562	9	17	45.1
Parsons Rapids	565-570	9	19	90.8
Hopkins Canyon	571-578.5	20	44	191.8
Nespelem River	578.5-584.5	18	28	131.6
Buckley Bar	584.5-588	10	16	54.1
Sanderson Creek	588-590	1	3	11.0
Total	—	69	133	550.0

[1] RM = River Mile

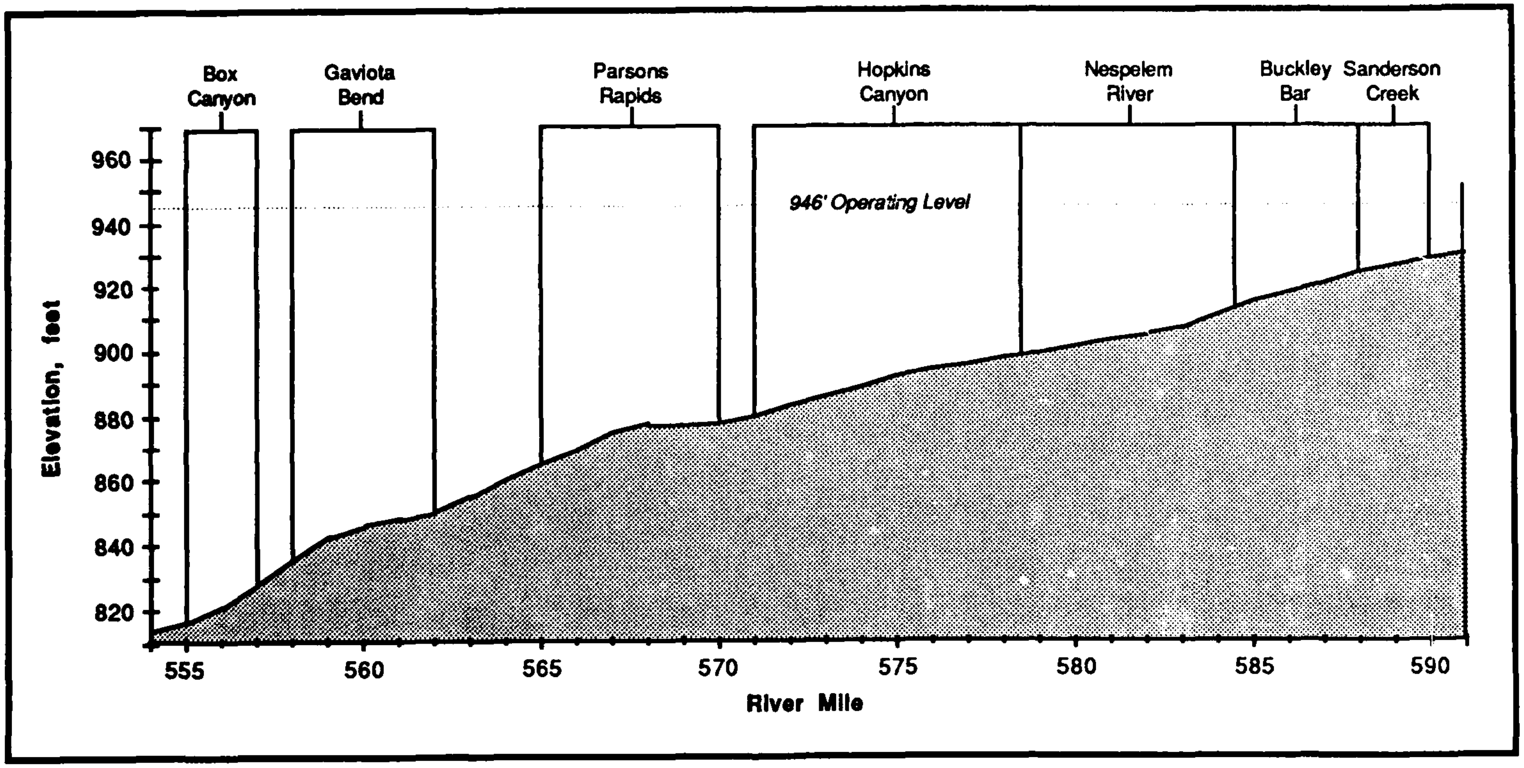

Figure 8.4. Cross-section of pre-dam Columbia River profile between RM 554 and 591 in relation to geographic clusters. (Data adapted from USGS 1950 quadrangles)

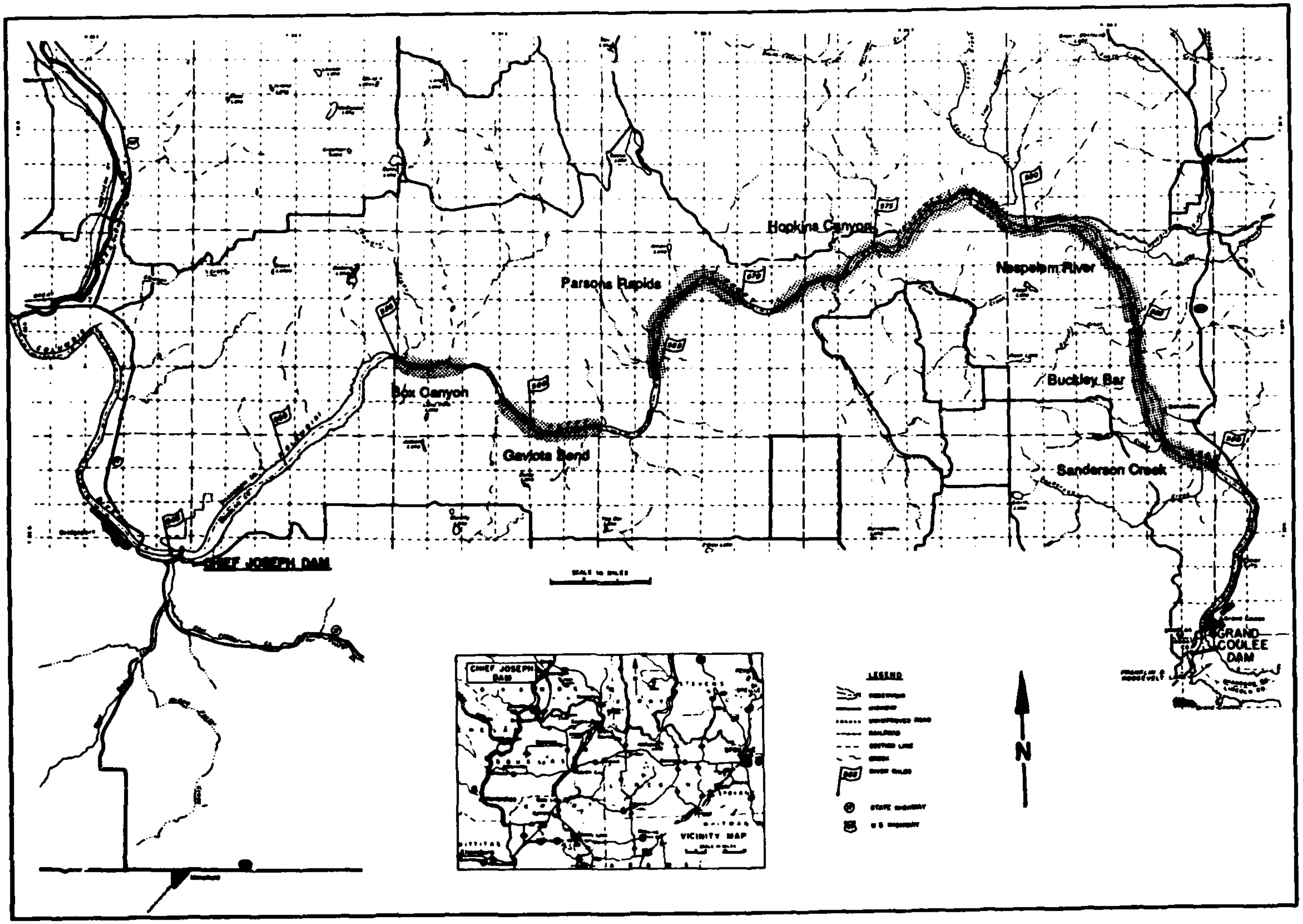

Figure 8.5. Distribution of proposed geographic clusters along Columbia River floodplain.

Table 8.8 through 8.12 and Figures 8.6 through 8.10 summarize the results of our analysis in both tabular and graphic forms. Based on these displays, several conclusions seem warranted. First, and most important, the numbers and kinds of materials appearing in the archaeological record are not at all uniform from one end of the project area to the other. For the most part, occupation density tends to increase the farther upstream one goes. This is not at all surprising given that the upstream reaches of the river exhibit by far more broad benches and terraces suitable for human occupation.

The frequencies of lithic raw materials also appear to be geographically dependent. Use of jasper tends to increase at the expense of chalcedony as one moves upstream; quartzite occurs most commonly in the middle reach of the river. At the same time, however, the frequencies of lithic object types do not vary significantly. These observations suggest that although source materials may vary somewhat depending on local availability, the technological sequences used to produce lithic tools from such raw materials are uniform geographically. This conclusion is further supported by the distributional patterns of functional tool classes -- tool class fréquencies are relatively uniform across space.

Time - Space Interactions

Although sufficient data are not available to warrant detailed examination of time-space interactions among occupation components in terms of the various technological, functional, and stylistic classes, one aspect of this matter deserves comment. Specifically, the distribution of dated occupation components is not uniform across space. Table 8.13 summarizes the mean ages of all components by geographic cluster. Disregarding the Box Canyon and Sanderson Creek clusters -- neither has sufficient dated components to justify further consideration -- the data strongly suggest that the mean age of components declines as one moves upstream.

The observed temporal gradient most likely is *due to the differential loss of prehistoric* habitation sites as a consequence of the creation of Rufus Woods Lake behind Chief Joseph Dam. Given that most habitation sites occur on terraces immediately adjacent to the river, we would expect the original pool raise to have inundated a disproportionately large number of sites along the lower reaches of the river, where the reservoir is its deepest (see Figure 8.5). Consequently, it is not at all surprising that late habitation sites are underrepresented in the survey sample from Gaviota Bend; most such sites were flooded 30 years ago. Instead, the sample of sites we have access to at the downstream end of the reservoir tends to consist of relatively shallow, small, low-density occupation loci containing limited artifact assemblages. Both bone and shell are virtually absent, and FMR occur infrequently; however, lithic debitage and worn/manufactured objects appear in some abundance. Based on these and other data, most sites in this area appear to be temporary camps established to accomplish a limited set of activities, most likely related to hunting or plant gathering and processing.

These observations have particular interest for research and management planning; different reaches of the reservoir will be useful for different types of problems and will require different data acquisition strategies. For example, research questions focusing on the content, structure, or evolution of pithouse settlements will be best served by sites in the upper part of the reservoir. On the other hand, those questions involving examination of the broadest possible range of activity loci will benefit from inclusion of sites at the lower end of the reservoir. Effective resource management requires that we recognize the various research constituencies to which a given site may contribute and provide for access to relevant data. This strategy was central to our planning efforts and is described in detail elsewhere (Jermann et al. 1978).

Table 8.8
Distribution of General Assemblage Constituents by Geographic Cluster

Geographic Cluster	Material Category			
	Bone Weight (g)	Shell #	FMR Weight (g)	Lithics #
Box Canyon	94	0	0	1,191
	3.7[a]	*0.0*	*0.0*	*46.5*
Gaviota Bend	535	12	25,805	729
	11.9	*0.3*	*572.2*	*16.2*
Parsons Rapids	1,190	1,485	87,069	962
	24.3	*16.4*	*958.9*	*10.6*
Hopkins Canyon	14,179	10,167	449,046	3,475
	73.9	*53.0*	*2,3421.2*	*18.1*
Nespelem River	3,929	3,304	354,191	3,788
	29.8	*25.1*	*2,687.3*	*28.7*
Buckley Bar	2,876	486	98,635	2,880
	53.0	*9.0*	*1823.2*	*53.2*
Sanderson Creek	311	2,913	1,140	348
	28.3	*264.8*	*103.6*	*31.6*
Total	23,114	18,367	1,015,886	13,373
	42.0	*33.4*	*1,846.4*	*24.3*

[a] Italics = density per cubic meter

Table 8.9
Distribution of General Faunal Categories by Geographic Cluster

Geographic Cluster	Faunal Category				
	Large Herbivore	Small Herbivore	Carnivore	Fish	Turtle
Box Canyon	5	2	0	9	1
	0.2[a]	*0.1*	*0.0*	*0.4*	*0.0*
Gaviota Bend	53	22	0	5	7
	1.2	*0.5*	*0.0*	*0.1*	*0.2*
Parsons Rapids	97	2	1	8	1
	1.1	*0.0*	*0.0*	*0.1*	*0.0*
Hopkins Canyon	1,082	25	9	69	22
	5.6	*0.1*	*0.0*	*0.4*	*0.1*
Nespelem River	302	8	1	5	3
	2.3	*0.1*	*0.0*	*0.0*	*0.0*
Buckley Bar	75	18	4	21	0
	1.4	*0.3*	*0.1*	*0.4*	*0.0*
Sanderson Creek	80	2	0	20	6
	7.3	*0.2*	*0.0*	*1.8*	*0.5*
Total	1,694	79	15	137	40
	3.1	*0.1*	*0.0*	*0.2*	*0.1*

[a] Italics = density per cubic meter

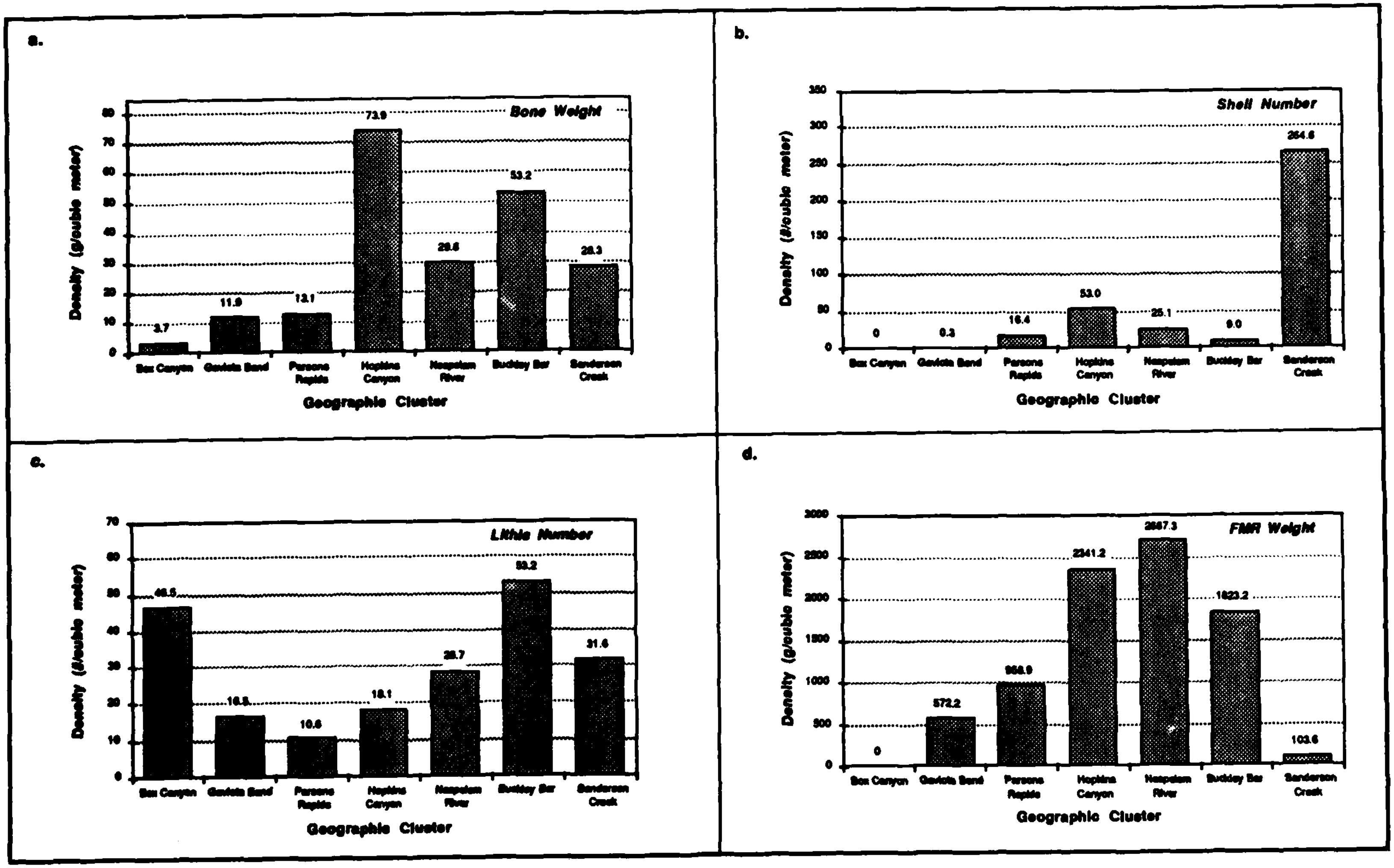

Figure 8.6. Distribution of general assemblage constituents by geographic cluster.

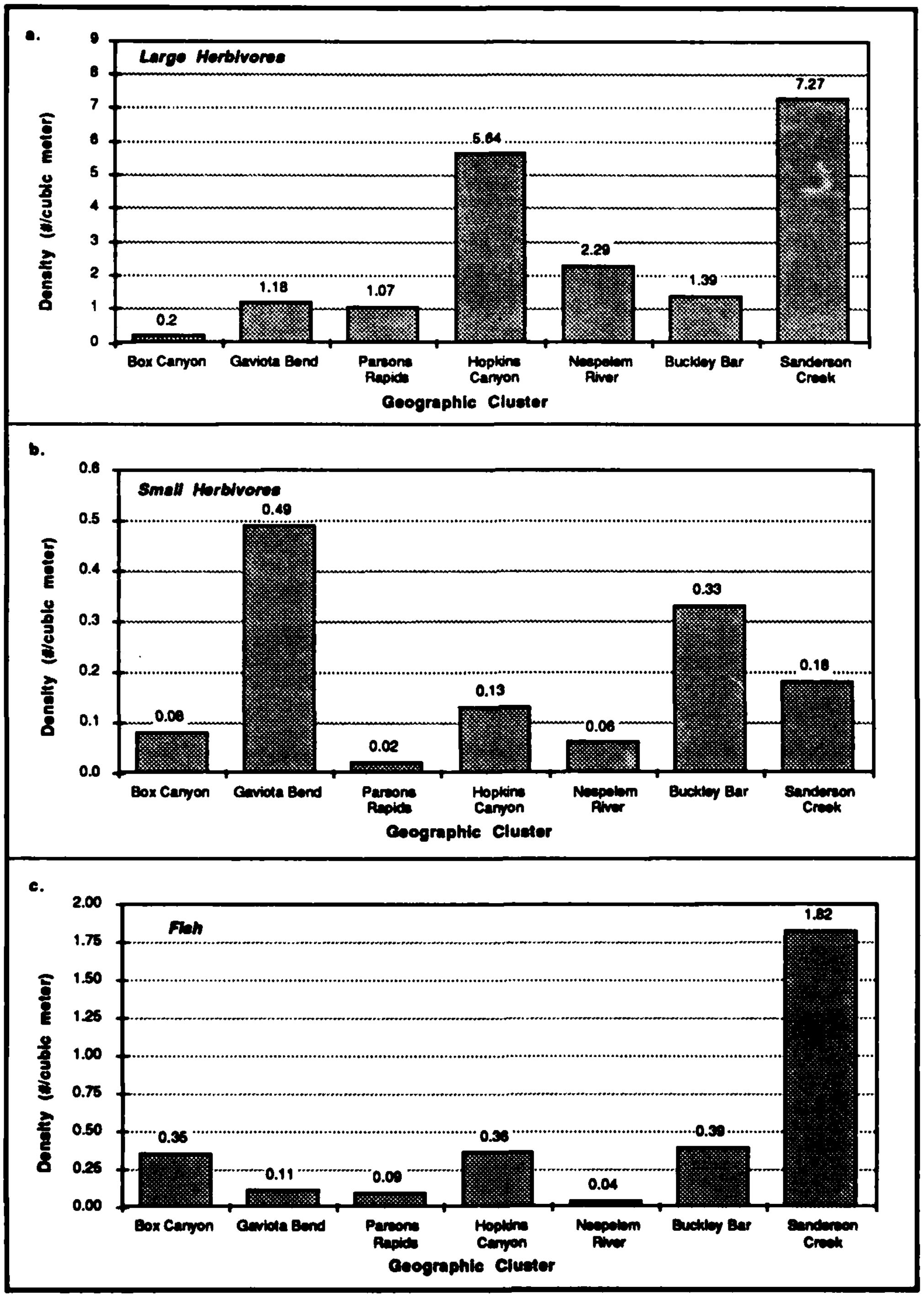

Figure 8.7. Density of general fauna categories by geographic cluster.

Table 8.10
Distribution of Lithic Material Type by Geographic Cluster

Geographic Cluster	Material Type						Total
	Jasper	Chalcedony	Quartzite	Basalt	Granite	Argillite	
Box Canyon	712	418	27	6	0	4	1,167
	61.0[a]	*35.8*	*2.3*	*0.5*	*0.0*	*0.3*	
Gaviota Bend	352	179	73	31	8	35	678
	51.9	*26.4*	*10.8*	*4.6*	*1.2*	*5.2*	
Parsons Rapids	495	174	192	15	20	44	940
	52.7	*18.5*	*20.4*	*1.6*	*2.1*	*4.7*	
Hopkins Canyon	1,964	401	873	72	42	48	3,400
	57.8	*11.8*	*25.7*	*2.1*	*1.2*	*1.4*	
Nespelem River	2,849	422	337	48	38	56	3,750
	76.0	*11.3*	*9.0*	*1.3*	*1.0*	*1.5*	
Buckley Bar	1,975	390	293	18	15	171	2,862
	69.0	*13.6*	*10.2*	*0.6*	*0.5*	*6.0*	
Sanderson Creek	208	16	112	3	1	6	346
	60.1	*4.6*	*32.4*	*0.9*	*0.3*	*1.7*	
Total	8,555	2,000	1,907	193	124	364	13,143
	65.1	*15.2*	*14.5*	*1.5*	*0.9*	*2.8*	

[a] Italics = row percentages

Table 8.11
Distribution of Object Types by Geographic Cluster

Geographic Cluster	Object Type							Total
	Flake	Chunk	Core	Blade	Unmod.	Tab.Flk	Formed	
Box Canyon	1,067	49	2	44	0	17	12	1,191
	89.6[a]	*4.1*	*0.2*	*3.7*	*0.0*	*1.4*	*1.0*	
Gaviota Bend	537	62	3	10	10	62	29	713
	75.3	*8.7*	*0.4*	*1.4*	*1.4*	*8.7*	*4.1*	
Parsons Rapids	687	64	7	15	15	110	56	954
	72.0	*6.7*	*0.7*	*1.6*	*1.6*	*11.5*	*5.9*	
Hopkins Canyon	1,830	302	26	12	46	815	209	3,240
	56.5	*9.3*	*0.8*	*0.4*	*1.4*	*25.2*	*6.5*	
Nespelem River	3,065	223	9	17	40	260	155	3,769
	81.3	*5.9*	*0.2*	*0.5*	*0.1*	*6.9*	*4.1*	
Buckley Bar	2,247	202	5	59	7	240	97	2,857
	78.6	*7.1*	*0.2*	*2.1*	*0.2*	*8.4*	*3.4*	
Sanderson Creek	199	34	0	0	0	105	8	346
	57.5	*9.8*	*0.0*	*0.0*	*0.0*	*30.3*	*2.3*	
Total	9,632	936	52	157	118	1,609	566	13,070
	73.7	*7.2*	*0.4*	*1.2*	*0.9*	*12.3*	*4.3*	

[a] Italics = row percentages

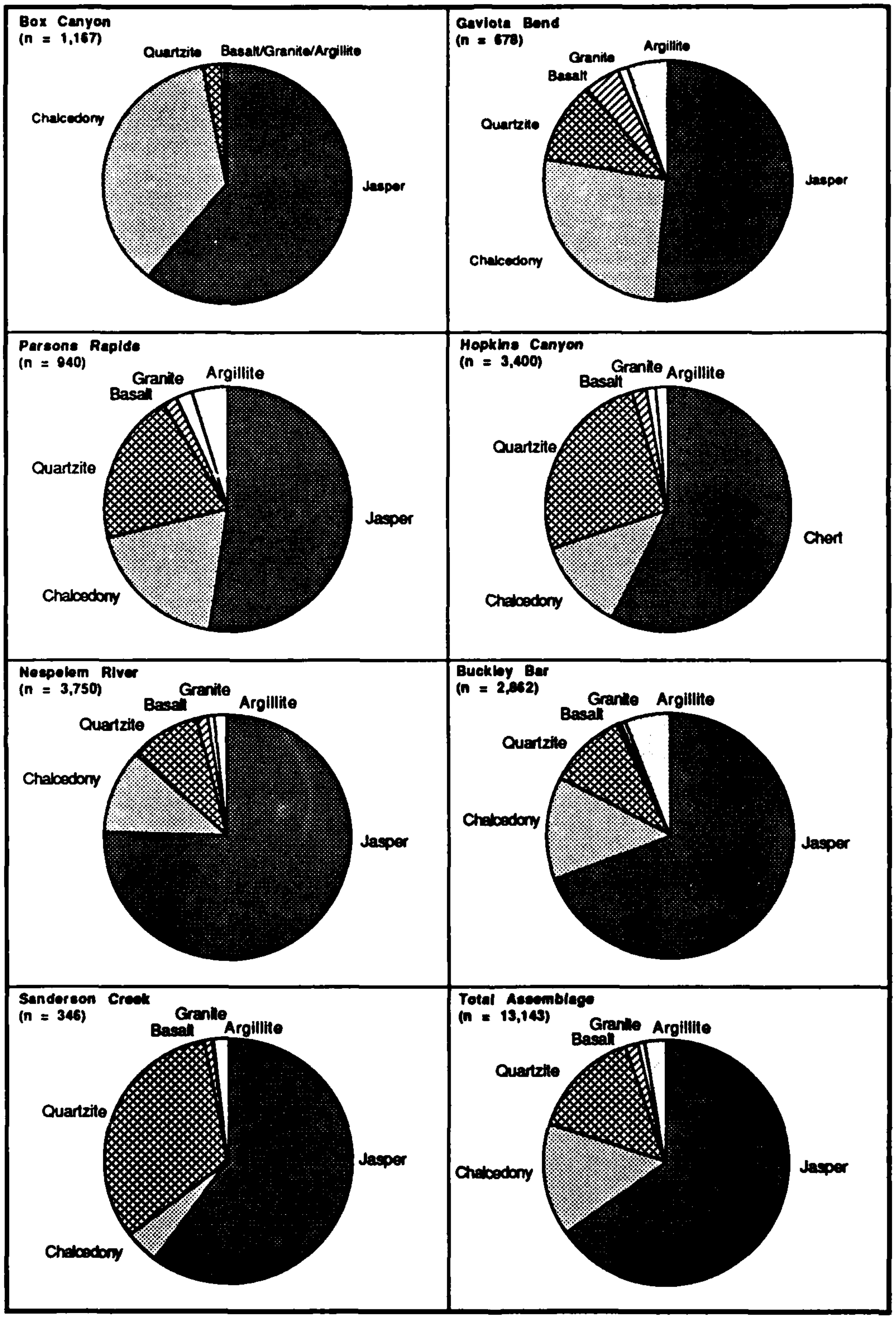

Figure 8.8. Frequency of lithic raw material by geographic cluster.

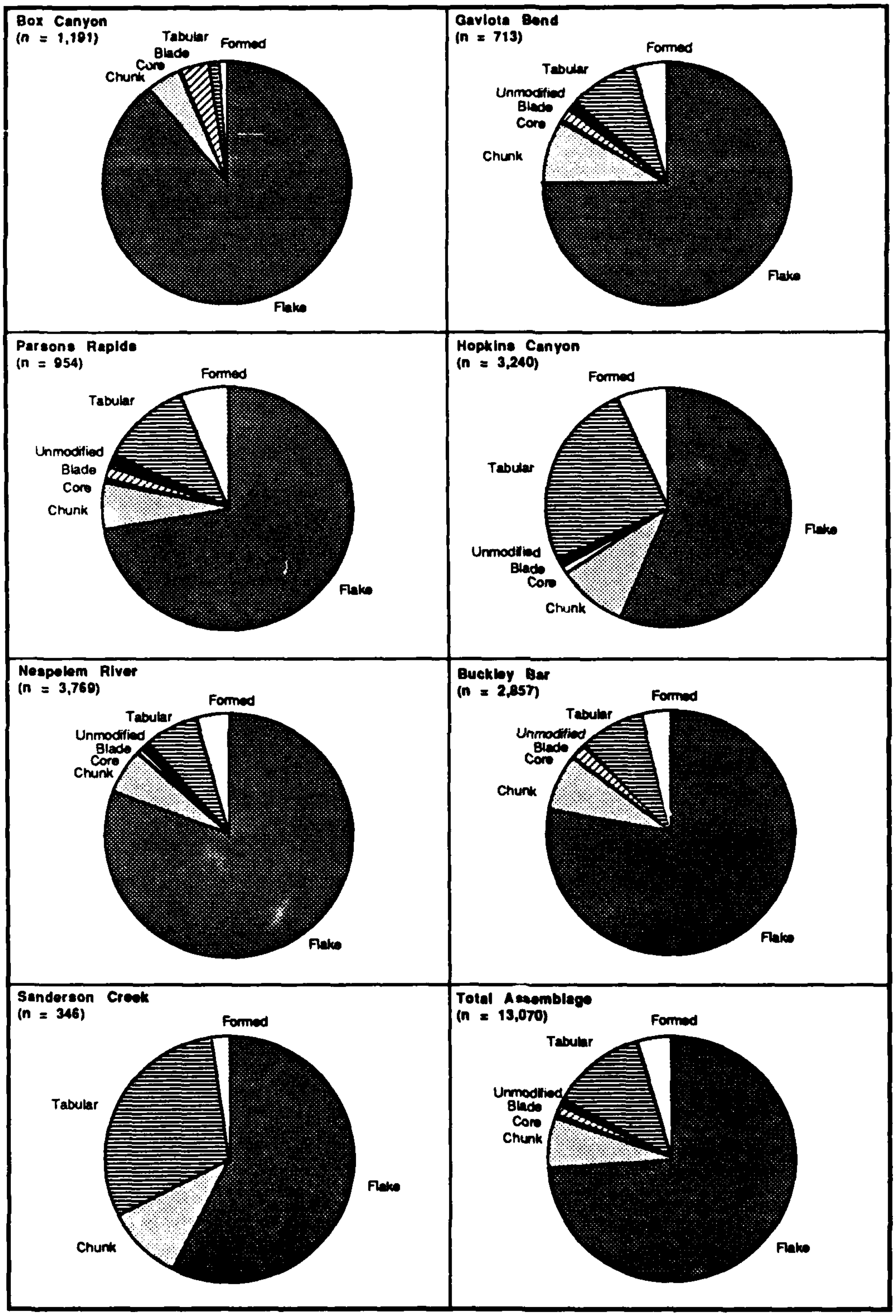

Figure 8.9. Frequency of lithic object types by geographic cluster.

Table 8.12
Distribution of Selected Tool Classes by Geographic Cluster

Geographic Cluster	Tool Class 12113	12123	12133	12213	12223	12233	2111	21121	21131	38143	Point	Total
Box Canyon	34	6	1	17	4	2	2	2	0	0	10	78
	43.6[a]	*7.7*	*1.3*	*21.8*	*5.1*	*2.6*	*2.6*	*2.6*	*0.0*	*0.0*	*12.8*	
Gaviota Bend	9	4	4	8	2	0	5	2	4	2	2	42
	21.4	*9.5*	*9.5*	*19.0*	*4.8*	*0.0*	*11.9*	*4.8*	*9.5*	*4.8*	*4.8*	
Parsons Rapids	10	12	22	3	3	6	7	7	3	4	4	81
	12.3	*14.8*	*27.2*	*3.7*	*3.7*	*7.4*	*8.6*	*8.6*	*3.7*	*4.9*	*4.9*	
Hopkins Canyon	72	56	28	27	16	6	37	27	13	28	19	329
	21.9	*17.0*	*8.5*	*8.2*	*4.9*	*1.8*	*11.8*	*8.2*	*4.0*	*8.5*	*5.8*	
Nespelem River	97	38	30	43	17	11	10	14	14	19	10	303
	32.0	*12.5*	*9.9*	*14.2*	*5.6*	*3.6*	*3.3*	*4.6*	*4.6*	*6.3*	*3.3*	
Buckley Bar	35	21	17	16	14	10	7	4	6	11	3	144
	24.3	*14.6*	*11.8*	*11.1*	*9.7*	*6.9*	*4.9*	*2.8*	*4.2*	*7.6*	*2.1*	
Sanderson Creek	7	6	2	6	1	1	2	0	0	0	1	26
	26.9	*23.1*	*7.7*	*23.1*	*3.8*	*3.8*	*7.7*	*0.0*	*0.0*	*0.0*	*3.8*	
Total	264	143	104	120	57	36	70	56	40	64	49	1,003
	26.3	*14.3*	*10.4*	*12.0*	*5.7*	*3.6*	*7.0*	*5.6*	*4.0*	*6.4*	*4.9*	

[a] Italics = row percentages

Table 8.13
Mean Age of Dated Components by Geographic Cluster

Cluster	Number of Components	Mean Age (years B.P.)[1]	Standard Deviation (years B.P.)[1]
Box Canyon	1	5,800	0
Gaviota Bend	6	3,650	1,898
Parsons Rapids	9	2,144	1,304
Hopkins Canyon	20	2,435	1,530
Nespelem River	13	1,931	1,344
Buckley Bar	6	1,467	909
Sanderson Creek	2	3,900	0

[1] Half-life = 5,730 years

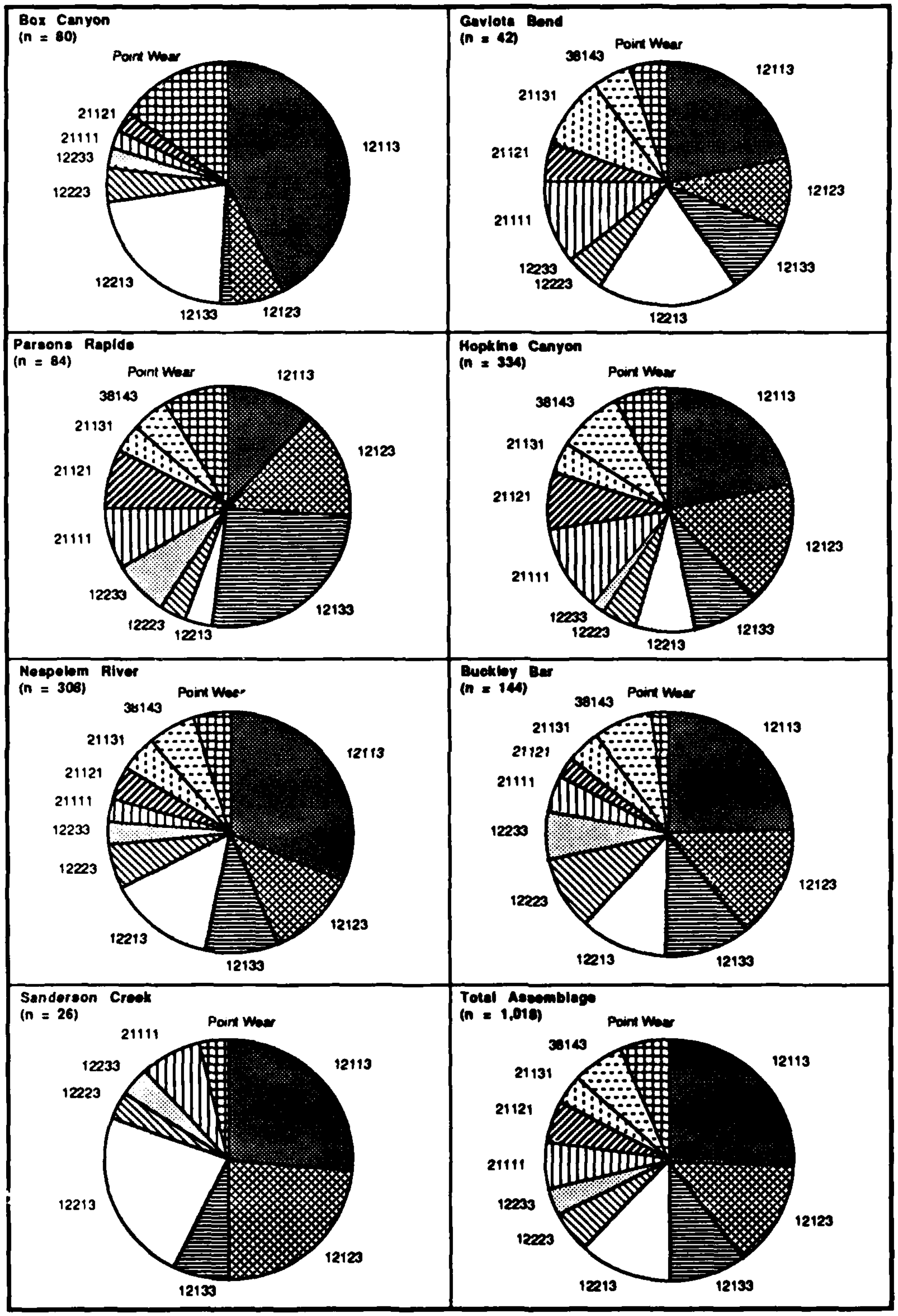

Figure 8.10. Frequency of selected tool classes by geographic cluster.

9. Summary and Conclusions

Data collection and analyses conducted during survey-level investigations at the Chief Joseph Dam Project were designed to provide information on which to base a comprehensive plan for cultural resources management. In this regard, the primary goals of this report were to summarize the natural and cultural contexts within which prehistoric occupation remains occur at the project, to describe the methods we employed in the collection and analysis of survey-level data, and to describe and discuss the results of our analytic efforts. Although my efforts here have been concerned largely with description rather than interpretation, several important results have emerged from the survey program.

Perhaps the single most important facet of these studies is their scope. In addition to generating relatively comprehensive inventory data for an 80-kilometer reach of the upper Columbia River, we were able to conduct test excavations at nearly 80 separate habitation loci. The resulting sample of artifacts and records is without parallel in the Pacific Northwest.

Before beginning work in the fall of 1977, relatively little was known about the prehistory of the area. This is no longer the case. Radiocarbon age determinations on more than 30 charcoal sample from known cultural contexts demonstrate continuous use and occupation of the area spanning at least the last 5,000 years. In addition, sample data from nearly 150 occupation components indicate that regional subsistence and settlement patterns are not uniform across time or space; significant temporal and geographic variability are manifest in the archaeological record.

The current program represents a beginning and not an end. Survey data in and of themselves seldom are adequate to answer most questions of general research interest; instead, they typically provide a general framework within which to conduct problem-oriented research. In this regard, I have attempted to identify patterns within the testing assemblage that potentially could be used to structure follow-on investigations. Ultimately, however, the success of any such program must be judged by those who follow -- I can only hope that my successors will benefit from my efforts.

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APPENDIX A

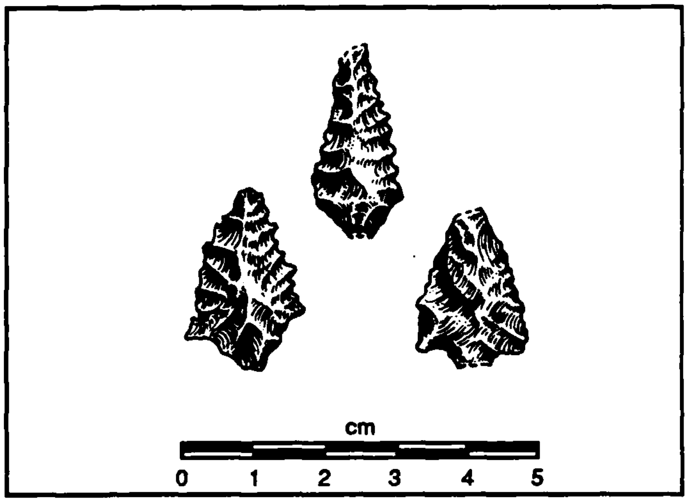
RESOURCE FACT SHEETS

APPENDIX B

PROJECTILE POINT CLASSES

Chief Joseph Dam Cultural Resources Survey
STEMMED PROJECTILE POINTS

CLUSTER NUMBER 1



COMPLETE SPECIMENS: 21

BROKEN SPECIMENS: 4

RAW MATERIAL

Cryptocrystalline: 18

Basalt: 5

Other: 2 (argillite)

CLUSTER DESCRIPTION

Basic Shape: Triangular, some elongated triangular

Notch Disposition: Corner-removed

Blade/Haft Relationship: Slightly overlapping to slightly separate

Haft Element Morphology: Slightly to extremely contracting

Basal Edge Morphology: Straight to convex; one pointed

DATING

Associated Radiocarbon Age Determinations:

2,450±260 (TX-3127)	2,940±200 (TX-2907)	3,550±520 (TX-2899)
2,810±340 (TX-2896)	3,050±230 (TX-2906)	3,860±580 (TX-3128)

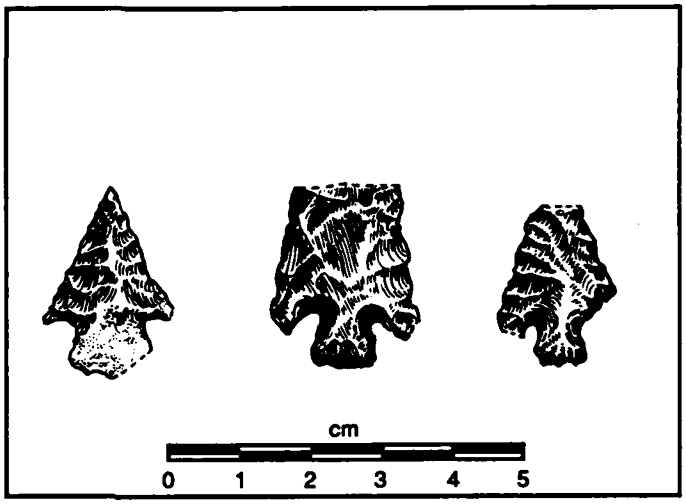
Estimated Temporal Range: 4,440 - 2,200 BP

COMMENTS

This cluster contains all contracting stemmed points from the test excavations. Further refinements are expected when additional points recovered from salvage excavations are considered; however, the current estimated temporal range seems promising. In general, this cluster may be compared to Nelson's (1969) Type 3 category, assigned to the Frenchmen Springs phase, and to Grabert's (1968) Group IIB, assigned to the Chilliwist phase.

Chief Joseph Dam Cultural Resources Survey
STEMMED PROJECTILE POINTS

CLUSTER NUMBER 2



COMPLETE SPECIMENS: 13

BROKEN SPECIMENS: 2

RAW MATERIAL

Cryptocrystalline: 13

Basalt: 0

Other: 2 (argillite)

CLUSTER DESCRIPTION

Basic Shape: Triangular

Notch Disposition: Corner-removed

Blade/Haft Relationship: Slightly overlapping to planar

Haft Element Morphology: Slightly to moderately expanding

Basal Edge Morphology: Straight to convex

DATING

Associated Radiocarbon Age Determinations:

550±300 (TX-2904)	1,150±170 (TX-2898)	2,320±160 (TX-2903)
780±70 (TX-2902)	970±90 (TX-3061)	550±80 (TX-2901)

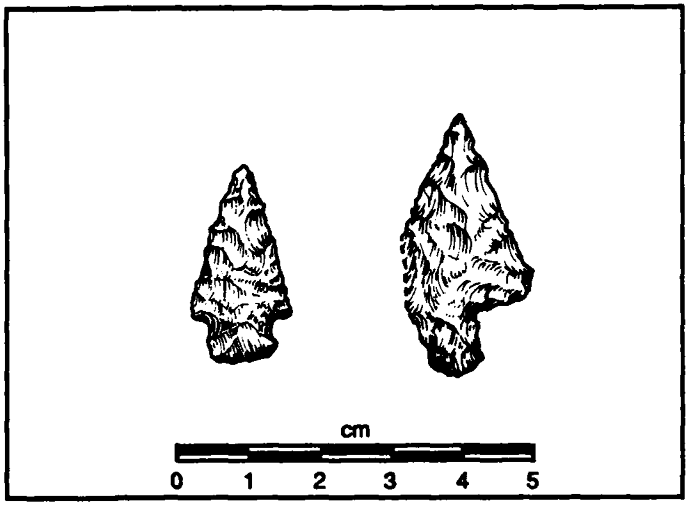
Estimated Temporal Range: 2,500 - 250 BP

COMMENTS

This cluster consists of points whose formal attributes do not exhibit a high degree of variability, although a tendency towards expandings stems and overlapping blades is noticeable. Three of the points in this cluster are from the same component at 45-OK-20 and are morphologically similar. Subdivisions within this cluster may be expected once salvage data are incorporated into the classification. Similar points are associated with Nelson's (1969) Cayuse phase.

Chief Joseph Dam Cultural Resources Survey
STEMMED PROJECTILE POINTS

CLUSTER NUMBER 3



COMPLETE SPECIMENS: 4

BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 4

Basalt: 0

Other: 0

CLUSTER DESCRIPTION

Basic Shape: Triangular

Notch Disposition: Corner-removed

Blade/Haft Relationship: Slightly planar

Haft Element Morphology: Slightly expanding

Basal Edge Morphology: Slightly to extremely convex

DATING

Associated Radiocarbon Age Determinations:

2,320±160 (TX-2903)

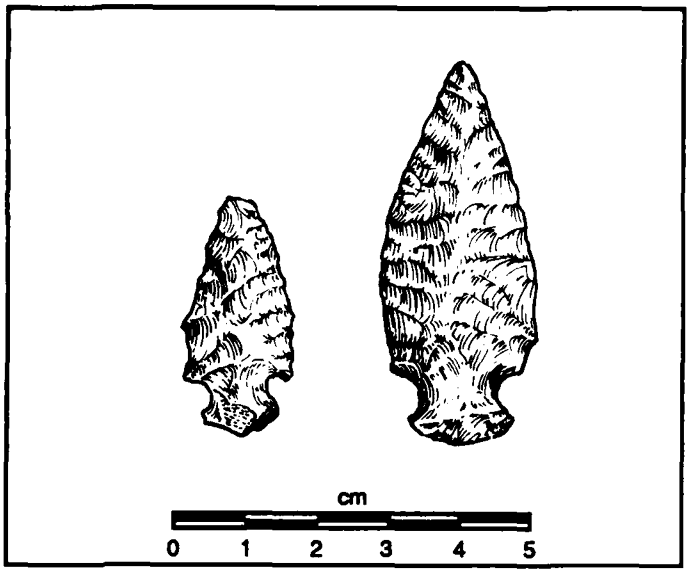
Estimated Temporal Range: 2,500 - 2,150 BP

COMMENTS

The four points that comprise this cluster all are fairly thick, corner-removed, and expanding-stemmed, with the stems comprising almost one-third of the total length of the points.

Chief Joseph Dam Cultural Resources Survey
STEMMED PROJECTILE POINTS

CLUSTER NUMBER 4



COMPLETE SPECIMENS: 2

BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 1

Basalt: 0

Other: 1 (obsidian)

CLUSTER DESCRIPTION

Basic Shape: Ovate

Notch Disposition: Corner-removed

Blade/Haft Relationship: Basically planar, tending toward slightly separate

Haft Element Morphology: Slightly expanding

Basal Edge Morphology: Convex

DATING

Associated Radiocarbon Age Determinations:

550±300 (TX-2904)

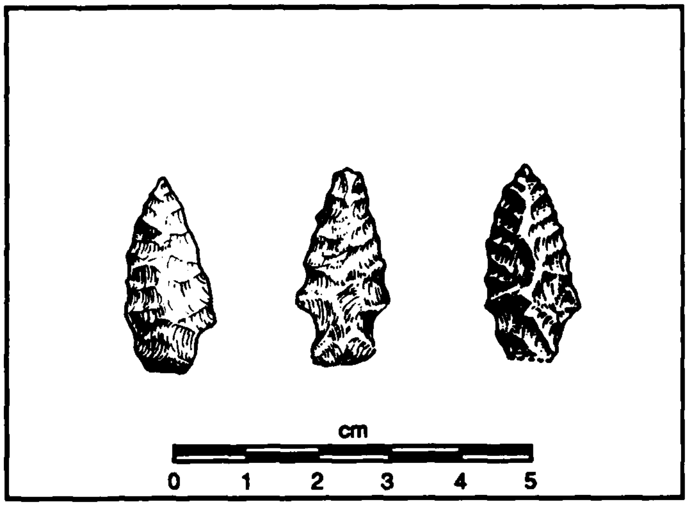
Estimated Temporal Range: 250 - 850 BP

COMMENTS

Both points in this cluster are elongate and fairly thick in cross-section.

Chief Joseph Dam Cultural Resources Survey
STEMMED PROJECTILE POINTS

CLUSTER NUMBER 5



COMPLETE SPECIMENS: 5

BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 4

Basalt: 1

Other: 0

CLUSTER DESCRIPTION

Basic Shape: Elongated triangular

Notch Disposition: Corner-removed

Blade/Haft Relationship: Almost disjunct to slightly separate

Haft Element Morphology: Slightly contracting to slightly expanding

Basal Edge Morphology: Almost straight

DATING

Associated Radiocarbon Age Determinations:

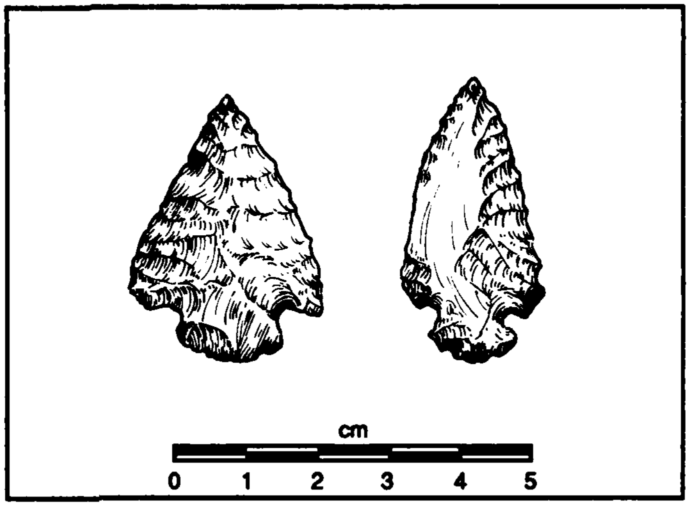
2450±160 (TX-3127) 3870±410 (TX-3059) 4420±190 (TX-3126)

Estimated Temporal Range: 4600 - 2300 BP

COMMENTS

These points are of moderate size. Their most characteristic attribute is their slightly separate blade/haft relationship; in two instances, the stems almost seem to blend into the blades.

Chief Joseph Dam Cultural Resources Survey
STEMMED PROJECTILE POINTS



CLUSTER NUMBER 6

COMPLETE SPECIMENS: 3

BROKEN SPECIMENS: 1

RAW MATERIAL

Cryptocrystalline: 4

Basalt: 0

Other: 0

CLUSTER DESCRIPTION

Basic Shape: Wide triangular

Notch Disposition: Corner-removed

Blade/Haft Relationship: Slightly overlapping to slightly separate

Haft Element Morphology: Expanding

Basal Edge Morphology: Slightly convex to convex

DATING

Associated Radiocarbon Age Determinations:

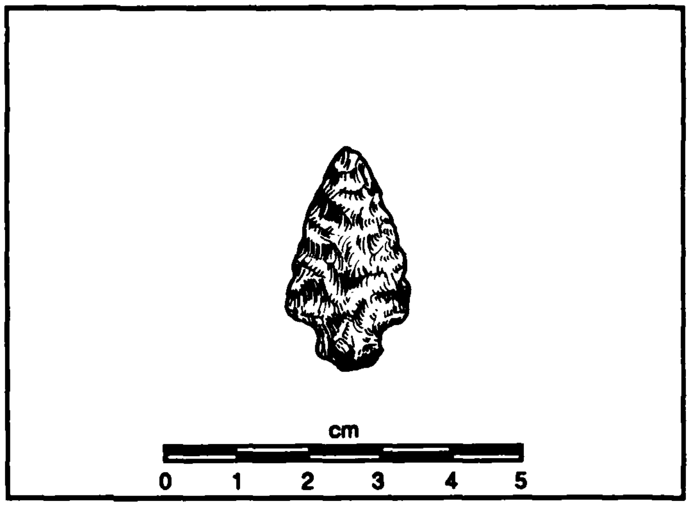
2320±160 (TX-2903)

Estimated Temporal Range: 2480 - 2160 BP

COMMENTS

The most noticeable characteristic of points in this cluster is their length/width ratio; the width is at least half the length. The blade is much longer than the stem.

Chief Joseph Dam Cultural Resources Survey
STEMMED PROJECTILE POINTS



CLUSTER NUMBER 7

COMPLETE SPECIMENS: 2

BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 1

Basalt: 0

Other: 1 (argillite)

CLUSTER DESCRIPTION

Basic Shape: Triangular

Notch Disposition: Corner-removed

Blade/Haft Relationship: Moderately separate

Haft Element Morphology: Contracting

Basal Edge Morphology: Concave

DATING

Associated Radiocarbon Age Determinations:

3,550±520 (TX-2899)

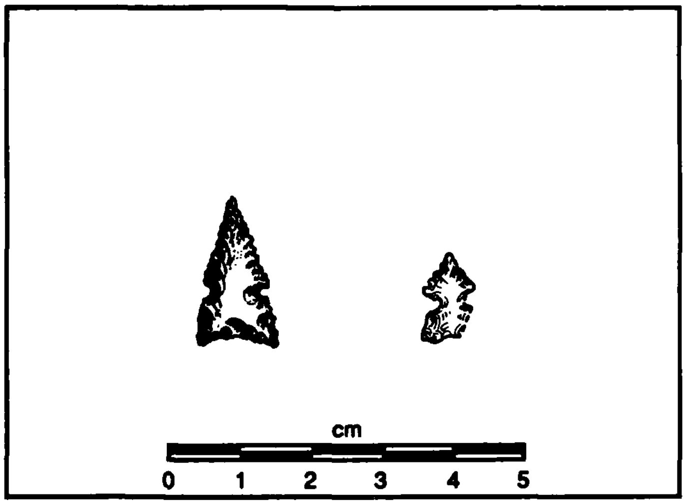
Estimated Temporal Range: 4,100 - 3,000 BP

COMMENTS

Members of this cluster are shouldered, corner-removed points that display fairly wide, contracting stems. Blades are proportionately much larger than stems. Members of this cluster bear similarities to Nelson's (1969) Type 3 points (Rabbit Island Stemmed), which in the Vantage area are assigned to the period between 4,000 and 3,000 BP.

Chief Joseph Dam Cultural Resources Survey
STEMMED PROJECTILE POINTS

CLUSTER NUMBER 8



COMPLETE SPECIMENS: 5

BROKEN SPECIMENS: 5

RAW MATERIAL

Cryptocrystalline: 7

Basalt: 0

Other: 3 (2 argillite; 1 obsidian)

CLUSTER DESCRIPTION

Basic Shape: Triangular

Notch Disposition: Side-notched

Blade/Haft Relationship: Separate

Haft Element Morphology: Unmodified

Basal Edge Morphology: Slightly concave to convex

DATING

Associated Radiocarbon Age Determinations:

550±300 (TX-2904) 880±100 (TX-3054)

Estimated Temporal Range: 1,000 - 200 BP

COMMENTS

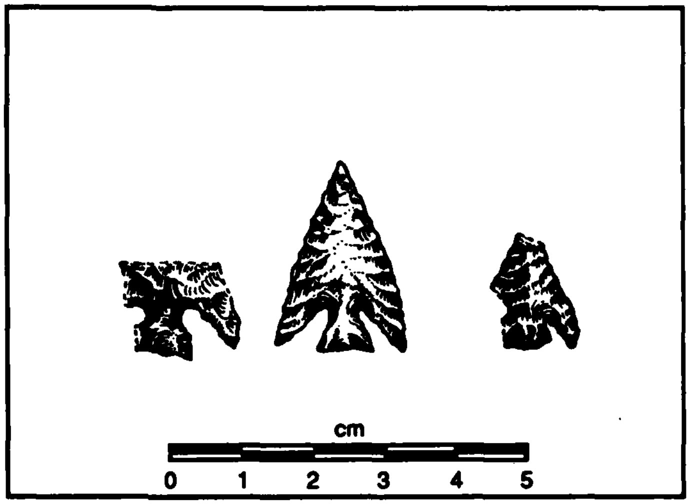
Points in this cluster compare well in both description and estimated age with so-called "Desert side-notched" points that occur elsewhere on the Plateau. They are similar to Grabert's (1968) Group IIIA points that are dated to approximately 275 BP, to Nelson's (1969) Type 10A points that he attributes to the Cayuse III subphase (<500 BP), and to Chance's (Chance and Chance 1977, 1979; Chance et al. 1977) points from the Shwayip period (<500 BP).

Chief Joseph Dam Cultural Resources Survey
STEMMED PROJECTILE POINTS

CLUSTER NUMBER 9

COMPLETE SPECIMENS: 5

BROKEN SPECIMENS: 2



RAW MATERIAL

Cryptocrystalline: 7

Basalt: 0

Other: 0

CLUSTER DESCRIPTION

Basic Shape: Wide triangular

Notch Disposition: Lateral basal-notched to corner-removed

Blade/Haft Relationship: Extremely overlapping

Haft Element Morphology: Straight to expanding

Basal Edge Morphology: Straight to very slightly convex

DATING

Associated Radiocarbon Age Determinations:

500±60 (TX-3058) 690±60 (TX-2895) 1,150±170 (TX-2898)

1,550±80 (TX-2901)

Estimated Temporal Range: 1,600 - 400 BP

COMMENTS

Although points in this cluster display a variety of sizes and formal attributes, the width of all specimens is one-half to one-third the length. These points are similar to those of Grabert's (1968) Group IA, assigned to the Cassimer Bar phase (ca. 500 BP), and to those of his Group VIII, assigned to the Indian Dan phase (ca. 6,000 - 3,500 BP). The;y also are similar to points in Nelson's (1969) Type 6C, which are attributed to the Cayuse phase in the Vantage area (ca. 1,000 BP).

Chief Joseph Dam Cultural Resources Survey
STEMMED PROJECTILE POINTS

CLUSTER NUMBER 10

COMPLETE SPECIMENS: 3

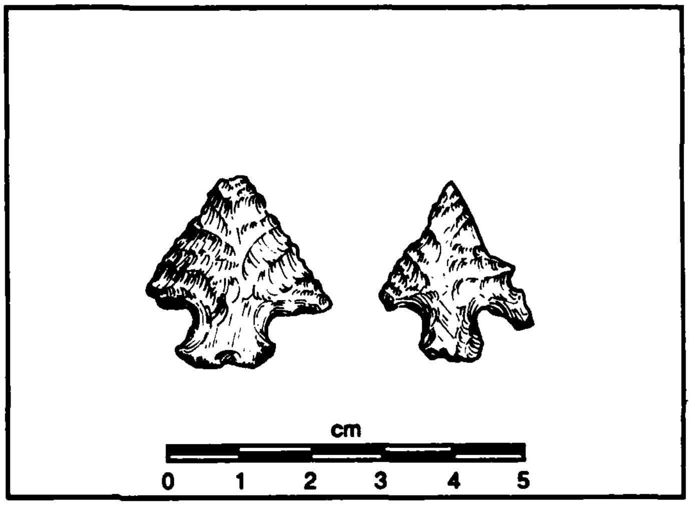
BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 3

Basalt: 0

Other: 0



CLUSTER DESCRIPTION

Basic Shape: Wide triangular

Notch Disposition: Corner-removed

Blade/Haft Relationship: Almost planar to overlapping

Haft Element Morphology: Slightly expanding to expanding

Basal Edge Morphology: Straight to convex

DATING

Associated Radiocarbon Age Determinations:

2,320±160 (TX-2903)

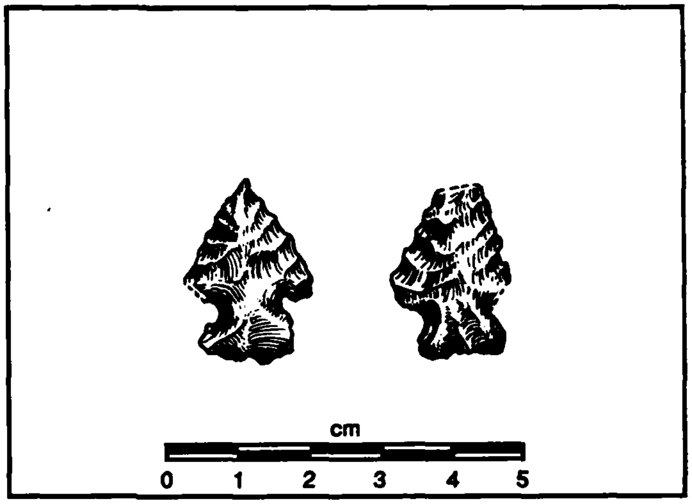
Estimated Temporal Range: 2,500 -2,150 BP

COMMENTS

Points in this cluster have less of an overlapping blade/haft elment than do those of Cluster 9. All three points are relatively short and wide. They are similar to Nelson's (1969) Type 5B points, assigned to the Cayuse phase (2,000 - 150 BP) in the Vantage area.

Chief Joseph Dam Cultural Resources Survey
STEMMED PROJECTILE POINTS

CLUSTER NUMBER 11



COMPLETE SPECIMENS: 2

BROKEN SPECIMENS: 1

RAW MATERIAL

Cryptocrystalline: 3

Basalt: 0

Other: 0

CLUSTER DESCRIPTION

Basic Shape: Triangular

Notch Disposition: Corner-removed

Blade/Haft Relationship: Slightly planar

Haft Element Morphology: Slightly expanding to expanding

Basal Edge Morphology: Basically straight

DATING

Associated Radiocarbon Age Determinations:

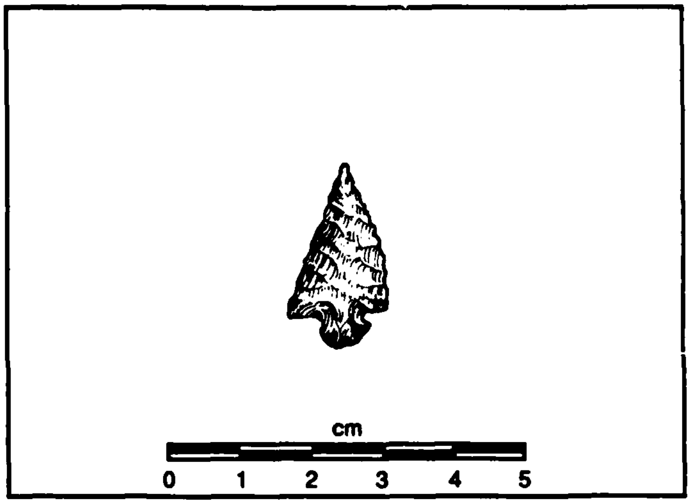
1,150±170 (TX-2898) 2,320±160 (TX-2903) (suspect)

Estimated Temporal Range: 1,500 - 900 BP

COMMENTS

In terms of their gross morphological form, points in this cluster are comparable to those in Cluster 3. The difference between the two groups lies in the blade/stem ratio and basal edge morphology. The blades of points in Cluster 11 are shorter and proportionately wider than those in Cluster 3, and the stems of points in Cluster 11 seem to comprise more of the total point length.

Chief Joseph Dam Cultural Resources Survey
STEMMED PROJECTILE POINTS



CLUSTER NUMBER 12

COMPLETE SPECIMENS: 1

BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 0

Basalt: 0

Other: 1 (argillite)

CLUSTER DESCRIPTION

Basic Shape: Triangular

Notch Disposition: Corner-removed

Blade/Haft Relationship: Planar

Haft Element Morphology: Slightly expanding

Basal Edge Morphology: Convex

DATING

Associated Radiocarbon Age Determinations:

No associated dates available

Estimated Temporal Range: Unknown

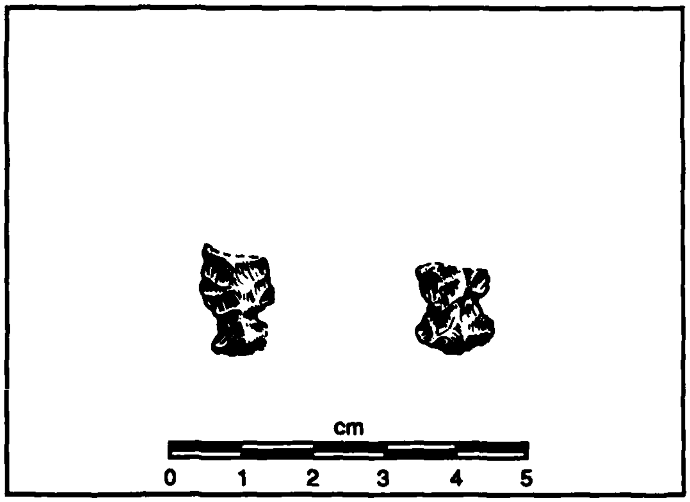
COMMENTS

Chief Joseph Dam Cultural Resources Survey
STEMMED PROJECTILE POINTS

CLUSTER NUMBER 13

COMPLETE SPECIMENS: 0

BROKEN SPECIMENS: 3



RAW MATERIAL

Cryptocrystalline: 3
Basalt: 0
Other: 0

CLUSTER DESCRIPTION

Basic Shape: Elongate triangular
Notch Disposition: Corner-removed
Blade/Haft Relationship: Disjunct to separate
Haft Element Morphology: Expanding
Basal Edge Morphology: Convex

DATING

Associated Radiocarbon Age Determinations:

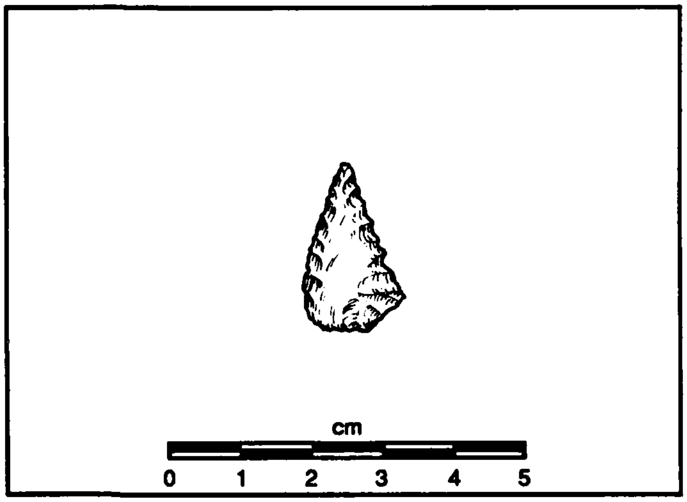
1,150±170 (TX-2898) 1,550±80 (TX-2901) 880±100 (TX-3054)

Estimated Temporal Range: 1,300 - 800 BP

COMMENTS

All points in this cluster are broken and were assigned manually to their own grouping because they display sufficient morphological and temporal similarity to warrant recognition as a separate cluster.

Chief Joseph Dam Cultural Resources Survey
UNSTEMMED PROJECTILE POINTS



CLUSTER NUMBER A

COMPLETE SPECIMENS: 2

BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 2

Basalt: 0

Other: 0

CLUSTER DESCRIPTION

Basic Shape: Triangular

Notch Disposition: Unnotched

Blade/Haft Relationship: No separate haft element

Haft Element Morphology: No separate haft element

Basal Edge Morphology: Convex

DATING

Associated Radiocarbon Age Determinations:

3,860±580 (TX-3128)

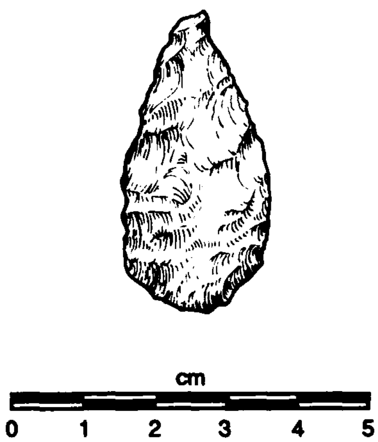
Estimated Temporal Range: 4,400 - 3,300 BP

COMMENTS

Both points in this cluster are fairly small.

Chief Joseph Dam Cultural Resources Survey
UNSTEMMED PROJECTILE POINTS

CLUSTER NUMBER B



COMPLETE SPECIMENS: 5

BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 3

Basalt: 1

Other: 1 (argillite)

CLUSTER DESCRIPTION

Basic Shape: Elongated ovate to triangular

Notch Disposition: Unnotched

Blade/Haft Relationship: No separate haft element

Haft Element Morphology: No separate haft element

Basal Edge Morphology: Convex

DATING

Associated Radiocarbon Age Determinations:

3,900±490 (TX-3063) 760±60 (TX-3134) 640±150 (TX-3133)

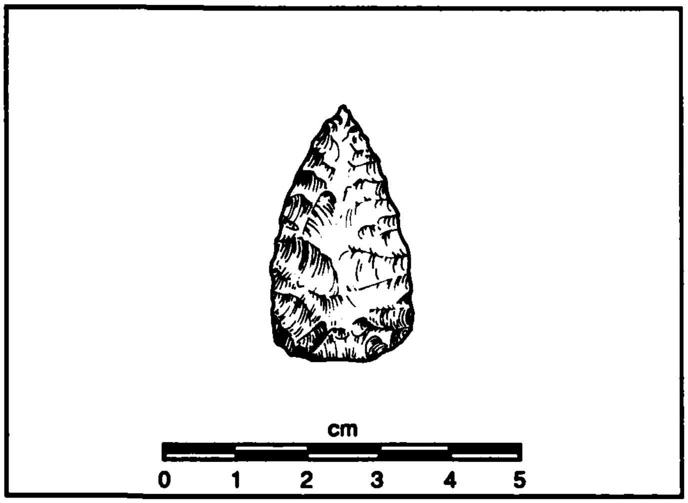
Estimated Temporal Range: 800 - 500 BP

COMMENTS

The point in this cluster that is dated to approximately 4,000 BP is manufactured of basalt and likely should be considered a separate type. Therefore, the estimated temporal range for this cluster is based the other two radiocarbon dates.

Chief Joseph Dam Cultural Resources Survey
UNSTEMMED PROJECTILE POINTS

CLUSTER NUMBER C



COMPLETE SPECIMENS: 1

BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 1

Basalt: 0

Other: 0

CLUSTER DESCRIPTION

Basic Shape: Ovate

Notch Disposition: Unnotched

Blade/Haft Relationship: No separate haft element

Haft Element Morphology: No separate haft element

Basal Edge Morphology: Convex

DATING

Associated Radiocarbon Age Determinations:

No associated dates available

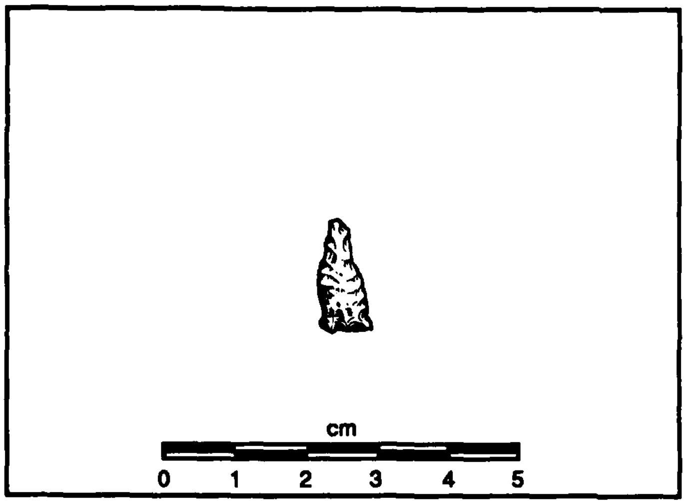
Estimated Temporal Range: Unknown

COMMENTS

Points in this cluster are similar to those in Cluster B, except that the maximum width position is closer to the base than to the middle of the object.

Chief Joseph Dam Cultural Resources Survey
UNSTEMMED PROJECTILE POINTS

CLUSTER NUMBER D



COMPLETE SPECIMENS: 1

BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 1

Basalt: 0

Other: 0

CLUSTER DESCRIPTION

Basic Shape: Elongated triangular

Notch Disposition: Unnotched

Blade/Haft Relationship: No separate haft element

Haft Element Morphology: No separate haft element

Basal Edge Morphology: Straight

DATING

Associated Radiocarbon Age Determinations:

760±60 (TX-3053)

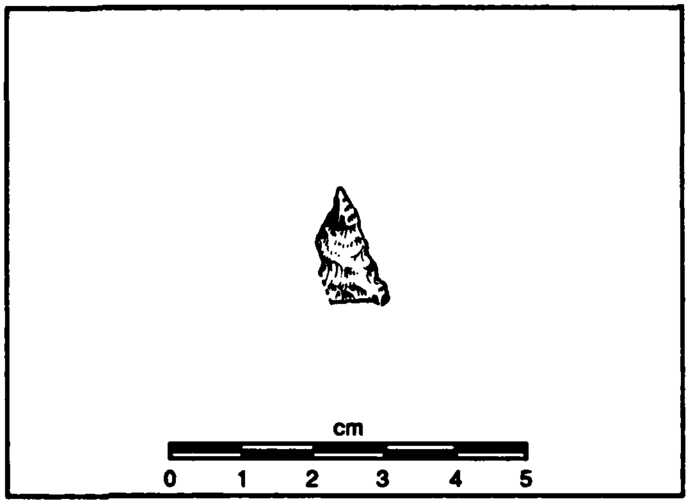
Estimated Temporal Range: 800 - 650 BP

COMMENTS

The one member of this cluster is the single smallest specimen in the projectile point assemblage; it is quite small and elongated compared to other triangular unstemmed points and may be a drill.

Chief Joseph Dam Cultural Resources Survey
UNSTEMMED PROJECTILE POINTS

CLUSTER NUMBER E



COMPLETE SPECIMENS: 0

BROKEN SPECIMENS: 3

RAW MATERIAL

Cryptocrystalline: 3

Basalt: 0

Other: 0

CLUSTER DESCRIPTION

Basic Shape: Triangular

Notch Disposition: Unnotched

Blade/Haft Relationship: No separate haft element

Haft Element Morphology: No separate haft element

Basal Edge Morphology: Concave

DATING

Associated Radiocarbon Age Determinations:

710±60 (TX-3053) 880±100 (TX-3054)

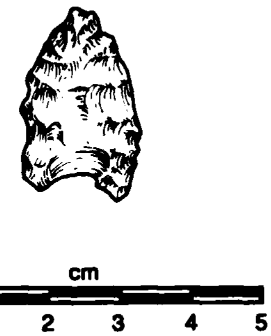
Estimated Temporal Range: 1,000 - 650 BP

COMMENTS

Although the members of this cluster come from three different sites, all are quite similar morphologically, and the associated radiocarbon dates also are very similar.

Chief Joseph Dam Cultural Resources Survey
UNSTEMMED PROJECTILE POINTS

CLUSTER NUMBER F



COMPLETE SPECIMENS: 1

BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 1

Basalt: 0

Other: 0

CLUSTER DESCRIPTION

Basic Shape: Ovate

Notch Disposition: Unnotched

Blade/Haft Relationship: No separate haft element

Haft Element Morphology: No separate haft element

Basal Edge Morphology: Notched, highly concave

DATING

Associated Radiocarbon Age Determinations:

No associated dates available

Estimated Temporal Range: Unknown

COMMENTS

The single point representative of this cluster is worked unifacially, although it displays evidence of slight retouch on the obverse side. It also is the only basally notched unstemmed point; the notch appears to be the result of the removal of a single large flake from the base. This point is similar to Windust phase points (Leonhardy and Rice 1970), which in the lower Snake River region are dated to before 8,000 BP; however, this specimen was recovered near the surface at 45-OK-11 and may be associated with housepit disturbance.

Chief Joseph Dam Cultural Resources Survey
UNSTEMMED PROJECTILE POINTS

CLUSTER NUMBER G

COMPLETE SPECIMENS: 2

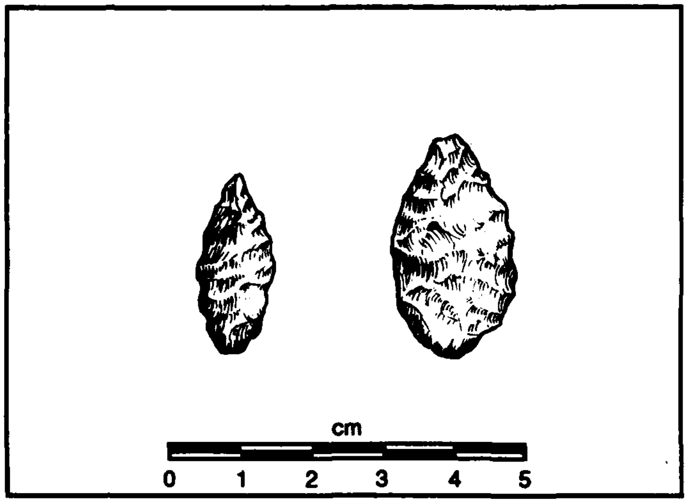
BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 2

Basalt: 0

Other: 0



CLUSTER DESCRIPTION

Basic Shape: Lanceolate/ovate

Notch Disposition: Unnotched

Blade/Haft Relationship: No separate haft element

Haft Element Morphology: No separate haft element

Basal Edge Morphology: Convex, approaching pointed

DATING

Associated Radiocarbon Age Determinations:

2,940±200 (TX-2907)

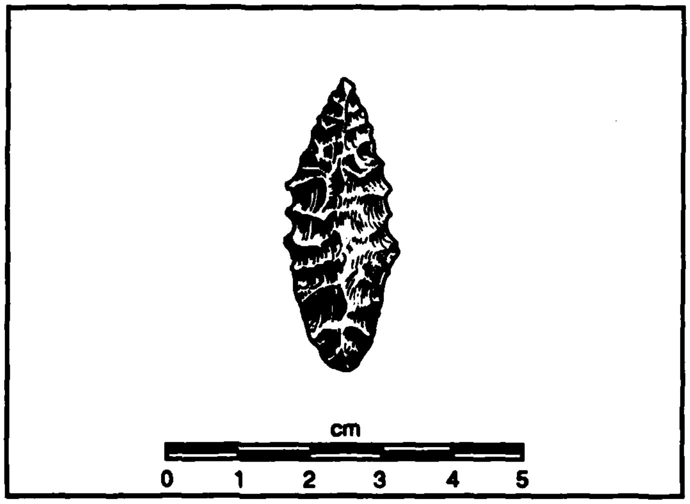
Estimated Temporal Range: 3,150 - 2,750 BP

COMMENTS

Points in this cluster generally are wider than those of Cluster H. In addition, the gross morphological outlines of points in Clusters G and K are similar.

Chief Joseph Dam Cultural Resources Survey
UNSTEMMED PROJECTILE POINTS

CLUSTER NUMBER H



COMPLETE SPECIMENS: 3

BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 2

Basalt: 1

Other: 0

CLUSTER DESCRIPTION

Basic Shape: Lanceolate

Notch Disposition: Unnotched

Blade/Haft Relationship: No separate haft element

Haft Element Morphology: No separate haft element

Basal Edge Morphology: Convex, approaching pointed

DATING

Associated Radiocarbon Age Determinations:

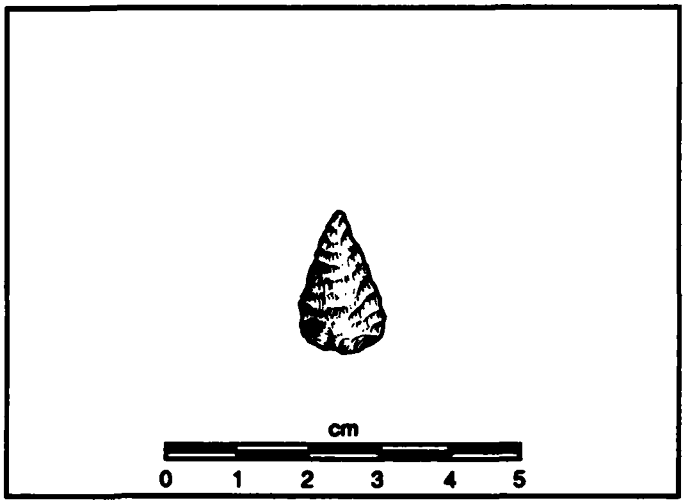
No associated dates available

Estimated Temporal Range: Unknown, probably 8,000 - 4,500 BP

COMMENTS

The blades of both cryptocrystalline points in this cluster are serrated. Points in this cluster are thick in cross section and relatively long and narrow in overall outline. They are reminiscent of Cascade phase points, which are dated to the period 8,000 to 5,000 BP in the lower Snake River region (Leonhardy and Rice 1970). The estimated temporal range for this cluster in the Rufus Woods Lake area is based on comparisons to dated contexts in other regions.

Chief Joseph Dam Cultural Resources Survey
UNSTEMMED PROJECTILE POINTS



CLUSTER NUMBER I

COMPLETE SPECIMENS: 2

BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 2

Basalt: 0

Other: 0

CLUSTER DESCRIPTION

Basic Shape: Ovate

Notch Disposition: Unnotched

Blade/Haft Relationship: No separate haft element

Haft Element Morphology: No separate haft element

Basal Edge Morphology: Convex

DATING

Associated Radiocarbon Age Determinations:

3,870±410 (TX-3059)

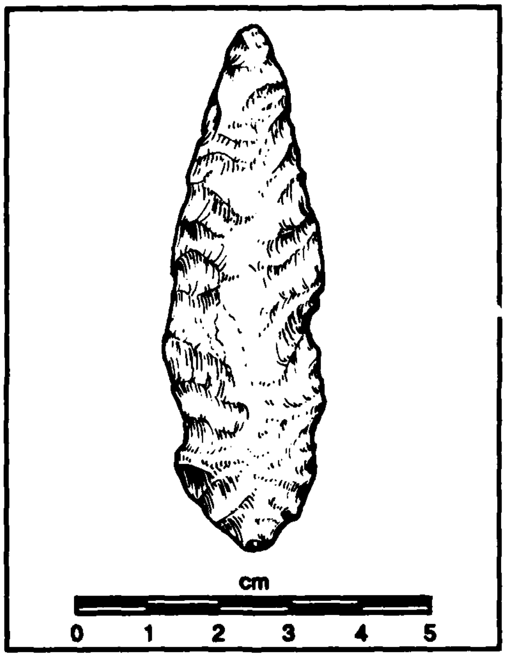
Estimated Temporal Range: 4,300 - 3,450 BP

COMMENTS

Although points in this cluster are similar in size and overall morphology to those in Clusters A and L, the maximum width occurs higher on the blade in this cluster.

Chief Joseph Dam Cultural Resources Survey
UNSTEMMED PROJECTILE POINTS

CLUSTER NUMBER J



COMPLETE SPECIMENS: 1

BROKEN SPECIMENS: 0

RAW MATERIAL

Cryptocrystalline: 0
Basalt: 0
Other: 1 (quartzite)

CLUSTER DESCRIPTION

Basic Shape: Lanceolate
Notch Disposition: Unnotched
Blade/Haft Relationship: No separate haft element
Haft Element Morphology: No separate haft element
Basal Edge Morphology: Extremely convex

DATING

Associated Radiocarbon Age Determinations:

570±70 (TX-2897)

Estimated Temporal Range: 650 - 500 BP

COMMENTS

The single representative of this cluster is also the largest point in the assemblage. Although this specimen might be considered a "knife" in more traditional contexts, it is included here because it exhibits the requisite attributes to be considered a "projectile point" and because it is the only such "knife" in the assemblage.

Chief Joseph Dam Cultural Resources Survey
UNSTEMMED PROJECTILE POINTS

CLUSTER NUMBER K

COMPLETE SPECIMENS: 1

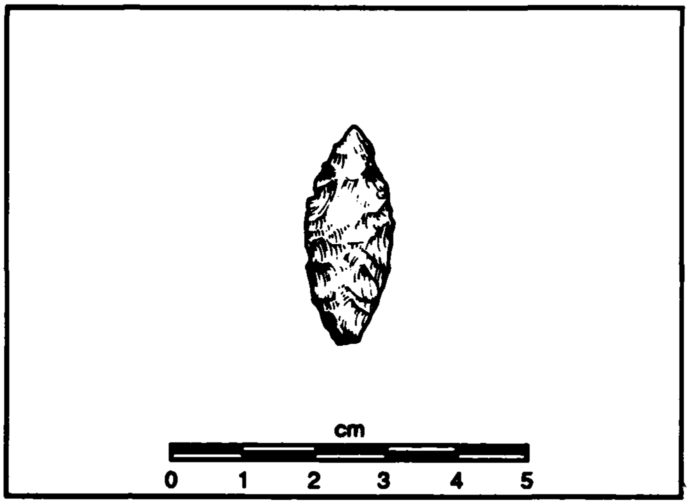
BROKEN SPECIMENS: 1

RAW MATERIAL

Cryptocrystalline: 1

Basalt: 1

Other: 0



CLUSTER DESCRIPTION

Basic Shape: Lanceolate

Notch Disposition: Unnotched

Blade/Haft Relationship: No separate haft element

Haft Element Morphology: No separate haft element

Basal Edge Morphology: Straight

DATING

Associated Radiocarbon Age Determinations:

3,900±490 (TX-3063)

Estimated Temporal Range: 4,400 - 3,400 BP

COMMENTS

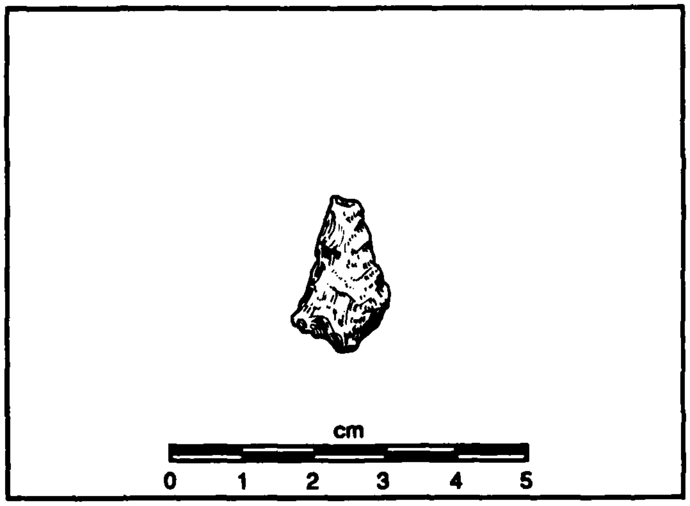
Points in this cluster are similar to those of Cluster G in gross outline; however, the maximum width of these points occurs higher up on the blade than do those of Cluster G.

Chief Joseph Dam Cultural Resources Survey
UNSTEMMED PROJECTILE POINTS

CLUSTER NUMBER L

COMPLETE SPECIMENS: 1

BROKEN SPECIMENS: 4



RAW MATERIAL

Cryptocrystalline: 4

Basalt: 0

Other: 1 (argillite)

CLUSTER DESCRIPTION

Basic Shape: Triangular

Notch Disposition: Unnotched

Blade/Haft Relationship: No separate haft element

Haft Element Morphology: No separate haft element

Basal Edge Morphology: Extremely convex

DATING

Associated Radiocarbon Age Determinations:

3,870±410 (TX-3059) 2,940±200 (TX-2907)

Estimated Temporal Range: 4,300 - 2,750 BP

COMMENTS

Points in this cluster are similar in size to those of Clusters H and I; however, in overall shape they approach "bi-triangular". Two of the cryptocrystalline specimens exhibit serrated blades.

Table B-1
Stemmed Projectile Points -- Metrical Attributes by Cluster

Cluster	Value	Attribute*: L	L_{HA}	L_{HL}	L_B	W_P	W	W_{BL}	W_S	W_{BE}	W_N	Thickness	Weight
	mean	304.8	46.3	44.4	248.7	61.7	167.8	167.3	93.8	56.8	0.0	50.9	23.0
	std.dev.	89.8	15.5	15.5	93.5	19.8	34.4	33.9	19.5	17.4	0.0	11.6	13.2
1	min	188.0	17.0	17.0	127.0	17.0	122.0	122.0	59.0	21.0	0.0	21.0	9.0
	max	580.0	72.0	67.0	520.0	103.0	260.0	260.0	142.0	90.0	0.0	79.0	61.0
	n	21	25	25	21	25	25	25	25	25	25	25	25
	mean	261.5	44.9	40.5	205.7	56.9	156.9	156.9	66.1	84.3	0.0	43.5	16.4
	std.dev.	59.3	14.6	8.3	56.6	16.3	30.3	30.3	13.6	19.1	0.0	10.6	9.7
2	min	149.0	9.0	25.0	110.0	31.0	110.0	110.0	44.0	63.0	0.0	29.0	5.0
	max	371.0	72.0	51.0	321.0	86.0	211.0	211.0	93.0	130.0	0.0	62.0	38.0
	n	14	15	15	15	15	15	15	15	15	15	15	15
	mean	329.0	71.5	52.5	237.5	91.8	183.8	183.8	99.0	101.2	0.0	63.5	30.2
	std.dev.	32.5	21.0	20.0	13.0	27.6	33.4	33.4	8.1	14.0	0.0	4.1	9.7
3	min	297.0	48.0	31.0	224.0	65.0	151.0	151.0	91.0	89.0	0.0	59.0	22.0
	max	359.0	95.0	77.0	254.0	124.0	215.0	215.0	109.0	117.0	0.0	67.0	41.0
	n	4	4	4	4	4	4	4	4	4	4	4	4
	mean	448.5	79.5	57.5	349.0	183.0	199.0	181.0	115.0	132.5	0.0	76.0	59.5
	std.dev.	139.3	14.8	19.1	125.9	38.2	52.3	39.6	19.8	24.7	0.0	2.8	48.8
4	min	350.0	69.0	44.0	260.0	156.0	162.0	153.0	101.0	115.0	0.0	74.0	25.0
	max	547.0	90.0	71.0	438.0	210.0	236.0	209.0	129.0	150.0	0.0	78.0	94.0
	n	2	2	2	2	2	2	2	2	2	2	2	2
	mean	277.2	65.2	59.4	198.6	87.0	125.0	119.8	92.0	77.6	0.0	54.2	16.6
	std.dev.	49.4	16.5	10.1	34.5	16.6	12.4	9.0	5.7	13.8	0.0	11.9	3.1
5	min	204.0	46.0	46.0	133.0	71.0	107.0	107.0	83.0	63.0	0.0	46.0	12.0
	max	339.0	91.0	74.0	231.0	108.0	141.0	129.0	98.0	95.0	0.0	75.0	20.0
	n	5	5	5	5	5	5	5	5	5	5	5	5
	mean	354.0	72.0	38.5	260.0	86.2	225.5	223.8	122.2	135.5	0.0	49.0	35.0
	std.dev.	44.8	19.2	14.6	53.9	25.5	47.7	45.6	22.3	19.1	0.0	19.1	14.8
6	min	296.0	51.0	27.0	193.0	60.0	172.0	172.0	101.0	117.0	0.0	21.0	17.0
	max	404.0	96.0	59.0	308.0	111.0	271.0	264.0	142.0	153.0	0.0	64.0	51.0
	n	4	4	4	4	4	4	4	4	4	4	4	4
	mean	271.5	38.0	31.5	156.0	66.0	150.5	150.5	74.5	60.0	0.0	53.5	18.0
	std.dev.	58.7	12.7	21.9	33.9	21.2	37.5	37.5	19.1	24.0	0.0	0.7	12.7
7	min	230.0	29.0	16.0	132.0	51.0	124.0	124.0	61.0	43.0	0.0	53.0	9.0
	max	313.0	47.0	47.0	180.0	81.0	177.0	177.0	88.0	77.0	0.0	54.0	27.0
	n	2	2	2	2	2	2	2	2	2	2	2	2
	mean	156.6	48.0	56.4	99.7	0.0	126.2	86.4	104.2	126.2	62.5	28.8	4.7
	std.dev.	35.9	7.8	8.8	52.4	0.0	22.5	16.9	20.7	22.5	15.8	6.3	1.7
8	min	126.0	34.0	44.0	55.0	0.0	100.0	56.0	78.0	100.0	37.0	20.0	2.0
	max	208.0	59.0	69.0	194.0	0.0	165.0	116.0	143.0	165.0	94.0	37.0	7.0
	n	5	9	9	6	9	9	8	9	9	10	10	10
	mean	252.2	48.3	45.9	238.3	13.7	210.7	210.7	69.7	87.3	0.0	36.7	17.0
	std.dev.	76.7	18.5	20.6	77.0	3.2	48.0	48.0	28.9	37.5	0.0	11.4	16.1
9	min	190.0	31.0	23.0	170.0	10.0	160.0	160.0	55.0	55.0	0.0	29.0	6.0
	max	391.0	78.0	78.0	375.0	18.0	310.0	310.0	136.0	169.0	0.0	58.0	45.0
	n	6	7	7	6	7	7	7	7	7	7	6	5
	mean	266.0	61.7	56.7	201.7	77.7	256.7	256.7	111.3	119.7	0.0	51.3	27.7
	std.dev.	24.2	2.5	8.7	37.5	9.1	15.3	15.3	21.7	21.7	0.0	12.9	8.0
10	min	238.0	59.0	47.0	165.0	68.0	240.0	240.0	88.0	96.0	0.0	42.0	20.0
	max	280.0	64.0	64.0	240.0	86.0	270.0	270.0	131.0	136.0	0.0	66.0	36.0
	n	3	3	3	3	3	3	3	3	3	3	3	3
	mean	264.5	64.0	56.0	163.0	106.0	186.3	186.3	102.3	121.0	0.0	50.3	19.0
	std.dev.	21.9	13.5	13.2	9.9	18.0	14.8	14.8	7.4	10.6	0.0	2.3	1.4
11	min	249.0	51.0	41.0	156.0	86.0	170.0	170.0	94.0	113.0	0.0	49.0	18.0
	max	280.0	78.0	66.0	170.0	121.0	199.0	199.0	108.0	133.0	0.0	53.0	20.0
	n	2	3	3	2	3	3	3	3	3	3	3	2
	mean	262.0	41.0	41.0	83.0	43.0	145.0	145.0	64.0	60.0	0.0	36.0	13.0
	std.dev.	0.0	0.0	0.0	0.0	0.0	0.0.	0.0.	0.0	0.0	0.0	0.0	0.0
12	min	262.0	41.0	41.0	83.0	43.0	145.0	145.0	64.0	60.0	0.0	36.0	13.0
	max	262.0	41.0	41.0	83.0	43.0	145.0	145.0	64.0	60.0	0.0	36.0	13.0
	n	1	1	1	1	1	1	1	1	1	1	1	1

* Definitions for attributes are provided in Figure 6.3; all measurements except weight in tenths of millimeters; weight in grams

Table B-2
Unstemmed Projectile Points -- Metrical Attributes by Cluster

Cluster	Value	Attribute* L_A	L_L	W_M	W_{MP}	W_B	T	T_P	Weight
	mean	218.0	190.5	1440.	0.0	144.0	37.0	31.0	9.5
	std.dev.	17.0	27.6	4.2	0.0	4.2	2.8	14.1	2.1
A	min	206.0	171.0	141.0	0.0	141.0	35.0	21.0	8.0
	max	230.0	210.0	147.0	0.0	147.0	39.0	41.0	11.0
	n	2	2	2	2	2	2	2	2
	mean	391.8	343.0	217.0	102.6	193.2	62.4	181.0	55.8
	std.dev.	97.6	73.2	58.4	33.4	64.7	10.1	74.7	43.5
B	min	270.0	240.0	166.0	60.0	140.0	50.0	110.0	20.0
	max	533.0	442.0	317.0	152.0	306.0	72.0	303.0	129.00
	n	5	5	5	5	5	5	5	5
	mean	594.0	566.0	321.0	168.0	231.0	81.0	136.0	131.0
	std.dev.		0.0	0.0	0.0	0.0	0.0	0.0	0.0
C	min	594.0	566.0	321.0	168.0	231.0	81.0	136.0	131.0
	max	594.0	566.0	321.0	168.0	231.0	81.0	136.0	131.0
	n	1	1	1	1	1	1	1	1
	mean	160.0	160.0	72.0	0.0	72.0	35.0	31.0	4.0
	std.dev.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	min	160.0	160.0	72.0	0.0	72.0	35.0	31.0	4.0
	max	160.0	160.0	72.0	0.0	72.0	35.0	31.0	4.0
	n	1	1	1	1	1	1	1	1
	mean	163.5	173.0	145.3	0.0	145.3	30.3	50.7	5.5
	std.dev.	5.0	4.2	10.1	0.0	10.1	7.1	19.1	0.7
E	min	160.0	170.0	139.0	0.0	139.0	24.0	35.0	5.0
	max	167.0	176.0	157.0	0.0	157.0	38.0	72.0	6.0
	n	2	2	2	2	2	2	2	2
	mean	231.0	261.0	181.0	96.0	147.0	55.0	139.0	21.0
	std.dev.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F	min	231.0	261.0	181.0	96.0	147.0	55.0	139.0	21.0
	max	231.0	261.0	181.0	96.0	147.0	55.0	139.0	21.0
	n	1	1	1	1	1	1	1	1
	mean	287.0	277.5	146.0	117.0	51.5	52.5	136.0	20.5
	std.dev.	48.1	34.6	46.7	7.1	17.7	5.0	52.3	12.0
G	min	253.0	253.0	113.0	112.0	39.0	49.0	99.0	12.0
	max	321.0	302.0	179.0	122.0	64.0	56.0	173.0	29.0
	n	2	2	2	2	2	2	2	2
	mean	419.7	404.7	141.3	155.7	52.0	69.3	198.0	34.3
	std.dev.	20.5	23.4	25.5	25.1	9.5	9.1	14.9	8.3
H	min	399.0	384.0	112.0	128.0	42.0	59.0	181.0	25.0
	max	440.0	430.0	158.0	177.0	61.0	76.0	209.0	41.0
	n	3	3	3	3	3	3	3	3
	mean	226.0	209.5	137.5	59.5	96.5	57.5	87.0	12.0
	std.dev.	33.9	29.0	16.3	24.7	14.8	0.7	7.1	1.4
I	min	202.0	189.0	126.0	42.0	86.0	57.0	82.0	11.0
	max	250.0	230.0	149.0	77.0	107.0	58.0	92.0	13.0
	n	2	2	2	2	2	2	2	2
	mean	733.0	692.0	229.0	244.0	186.0	74.0	452.0	128.0
	std.dev.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
J	min	733.0	692.0	229.0	244.0	186.0	74.0	452.0	128.0
	max	733.0	692.0	229.0	244.0	186.0	74.0	452.0	128.0
	n	1	1	1	1	1	1	1	1
	mean	353.0	353.0	170.0	167.0	64.5	50.5	136.0	44.0
	std.dev.	66.5	66.5	59.4	26.9	41.7	10.6	7.1	36.8
K	min	306.0	306.0	128.0	148.0	35.0	43.0	131.0	18.0
	max	400.0	400.0	212.0	186.0	94.0	58.0	141.0	70.0
	n	2	2	2	2	2	2	2	2
	mean	230.3	216.3	136.8	43.8	50.0	45.0	92.3	12.8
	std.dev.	17.6	21.2	18.4	32.9	62.9	7.8	29.7	5.7
L	min	210.0	199.0	114.0	0.0	0.0	36.0	54.0	6.0
	max	241.0	240.0	158.0	71.0	142.0	54.0	126.0	20.0
	n	3	3	4	4	4	4	4	4

*Definitions of attributes are provided in Figure 6.4; T = Thickness (mid); T_P = Thickness (proximal); all measurements except weight in tenths of millimeters; weight in grams.

APPENDIX C

IDENTIFIED FAUNA

Table C-1
Identified Fauna (NISP) by Occupation Component

SITE	Component	Large Herbivores: Odocoileus sp.	Cervus elaphus	Antilocapra sp.	Ovis canadensis	Bison bison	Unidentified	Sub-Total	Small Herbivores: Lepus sp.	Sylvilagus sp.	Marmota sp.	Castor sp.	Ondatra sp.	Unidentified	Sub-total	Carnivores: Canis sp.	Taxidea sp.	Felis sp.	Lynx sp.	Martes sp.	Unidentified	Sub-total	Fish: Salmonidae	Non-salmonidae	Unidentified	Sub-total	Reptiles/Amphibs.: Chrysemys sp.	Crotalus sp.	Bufo sp.	Unidentified	Sub-total	Rodents: Peromyscus sp.	Thomomys sp.	Citellus sp.	Perognathus sp.	Eutamias sp.	Neotoma sp.	Lagurus sp.	Microtus sp.	Unidentified	Sub-total	TOTAL
45-DO-102	1	1	—	—	—	—	2	3	—	—	—	—	—	—	0	—	—	—	—	—	—	0	1	—	—	1	—	—	—	—	0	—	1	—	—	—	—	—	—	—	1	5
45-DO-186	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	1	—	—	—	—	—	1	—	2	2
	2	1	—	—	—	—	—	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	1
45-DO-198	1	3	—	—	—	—	13	16	—	—	—	—	—	—	0	—	—	—	—	—	—	0	1	—	—	1	—	—	—	—	0	—	3	—	—	—	—	—	1	—	4	21
	2	3	—	—	—	—	15	18	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	1	—	—	—	—	—	—	1	2	20
45-DO-204	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
	2	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
	3	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
45-DO-211	1	3	—	—	—	—	30	33	—	—	—	—	—	—	0	—	—	—	—	—	—	0	14	—	2	16	6	—	—	1	7	—	21	3	—	—	—	—	—	—	24	80
	2	1	—	—	—	—	30	31	—	—	—	—	—	1	1	—	—	—	—	—	—	0	4	—	—	4	—	—	—	1	1	—	12	—	—	—	—	—	—	—	12	49
	3	—	—	—	—	—	16	16	1	—	—	—	—	—	1	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	1	—	1	18
45-DO-213	1	—	—	—	—	—	1	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	2	—	—	—	—	—	—	—	2	3
	2	—	—	—	—	—	13	13	—	—	1	—	—	—	1	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	1	—	1	15
45-DO-214	1	—	—	—	—	—	1	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	1
	2	6	—	—	—	—	—	6	—	1	2	1	—	—	4	—	—	—	—	—	—	0	3	—	1	4	—	1	—	—	1	—	2	—	2	—	—	—	—	—	4	19
45-DO-215	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	2	—	—	—	—	—	—	—	2	2
	2	—	—	—	—	—	5	5	—	—	1	—	—	—	1	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	9	—	—	—	—	—	—	—	9	15
45-DO-220	1	—	—	—	—	—	1	1	—	—	—	—	—	—	0	—	—	—	—	—	1	1	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	2
	2	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
45-DO-221	1	—	—	—	—	—	1	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	1
45-DO-222	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
	2	—	—	—	—	—	1	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	1
45-DO-233	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
45-DO-234	1	—	—	—	—	—	13	13	—	—	1	—	—	—	1	—	—	—	—	—	—	0	—	—	—	0	1	—	—	—	1	—	3	—	6	—	—	—	—	—	9	24
	2	—	—	—	—	—	1	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	5	—	—	—	—	—	—	—	5	6
45-DO-242	1	4	—	—	—	—	14	18	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	1	1	—	—	—	—	0	—	1	—	—	—	—	—	—	—	1	20
	2	7	—	—	2	—	29	38	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	38
	3	—	—	—	—	—	17	17	—	—	—	—	—	—	0	—	—	—	—	—	—	0	1	—	—	1	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	18
45-DO-243	1	—	—	—	—	—	13	13	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	13
	2	—	—	—	—	—	3	3	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	1	—	—	—	—	—	—	—	1	14
45-DO-248	1	7	—	—	—	—	15	22	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	22
45-DO-254	1	2	—	—	—	—	19	21	—	—	—	—	—	—	0	—	—	—	—	—	—	0	9	—	1	10	—	—	—	—	0	—	1	—	—	—	—	—	—	—	1	32
	2	1	—	—	—	—	19	20	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	1	1	2	—	—	—	2	—	2	—	—	—	—	—	—	—	2	25
	3	—	—	—	—	—	12	12	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	12

Table C-1 (Continued)

SITE	Component	Large Herbivores: Odocoileus sp.	Cervus elaphus	Antilocapra sp.	Ovis canadensis	Bison bison	Unidentified	Sub-Total	Small Herbivores: Lepus sp.	Sylvilagus sp.	Marmota sp.	Castor sp.	Ondatra sp.	Unidentified	Sub-total
45-DO-262	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-DO-265	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-DO-273	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	—	—	—	—	—	1	1	—	—	—	—	—	—	0
	3	—	—	—	—	—	1	1	—	—	—	—	—	—	0
45-DO-276	1	4	—	1	2	—	35	42	2	4	11	4	1	—	22
45-DO-282	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	—	—	—	—	—	1	1	—	—	—	—	—	—	0
	3	—	—	—	—	—	1	1	—	—	1	—	—	—	1
	4	—	—	—	—	—	2	2	—	1	—	—	—	—	1
45-DO-284	1	—	—	—	—	—	2	2	—	—	—	—	—	—	0
45-DO-285	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	10	—	—	—	11	5	26	—	—	3	—	—	—	3
45-DO-312	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-DO-325	1	6	1	—	1	1	—	9	—	—	9	—	—	—	9
45-OK-2A	1	—	—	—	—	—	2	2	—	—	—	—	—	—	0
	2	1	—	—	—	—	12	13	—	—	—	—	—	—	0
45-OK-11	1	115	3	8	1	—	314	441	1	—	9	1	—	—	11
	2	7	1	2	—	—	18	28	—	—	3	—	—	—	3
45-OK-12	1	1	1	—	—	—	27	29	—	—	—	—	—	—	0
	2	2	—	—	—	—	15	17	—	—	1	—	—	—	1
	3	3	—	—	—	—	19	22	—	—	2	—	—	—	2
45-OK-18	1	—	—	—	—	—	1	1	—	—	—	—	—	—	0
	2	1	—	—	—	—	—	1	—	—	—	—	—	—	0
45-OK-30	1	32	—	—	3	6	9	50	—	—	7	—	—	—	7
45-OK-38	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-158	1	4	—	—	—	—	4	8	—	—	—	—	—	—	0
45-OK-168	1	7	—	—	1	—	8	16	—	—	1	—	—	—	1
	2	—	—	—	—	—	8	8	—	—	—	—	—	—	0
45-OK-226	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	—	1	—	—	—	5	6	—	—	—	—	—	—	0
45-OK-229	1	1	—	—	1*	—	1	2	—	—	—	—	—	—	0

SITE	Component	Carnivores: Canis sp.	Taxidea sp.	Felis sp.	Lynx sp.	Martes sp.	Unidentified	Sub-total	Fish: Salmonidae	Non-salmonidae	Unidentified	Sub-total	Reptiles/Amphibs.: Chrysemys sp.	Crotalus sp.	Bufo sp.	Unidentified	Sub-total
45-DO-262	1	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
45-DO-265	1	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
45-DO-273	1	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
	3	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
45-DO-276	1	—	—	—	—	—	—	0	—	2	2	4	—	—	—	—	0
45-DO-282	1	—	—	—	—	—	—	0	4	—	—	4	—	—	—	—	0
	2	—	—	—	—	—	—	0	1	—	—	1	—	—	—	—	0
	3	—	—	—	—	—	—	0	1	—	2	3	—	—	—	—	0
	4	—	—	—	—	—	—	0	—	—	1	1	1	—	—	3	4
45-DO-284	1	1	—	—	—	—	—	1	—	1	1	2	—	—	—	—	0
45-DO-285	1	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
	2	—	1	—	—	—	—	1	—	—	—	0	—	—	—	—	0
45-DO-312	1	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
45-DO-325	1	—	—	—	—	—	1	1	8	6	—	14	—	—	—	—	0
45-OK-2A	1	—	—	—	—	—	—	0	2	—	—	2	1	—	—	—	1
	2	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
45-OK-11	1	—	—	—	—	1	—	1	—	—	3	3	4	—	1	—	5
	2	—	—	—	—	—	—	0	—	—	6	6	3	—	—	—	3
45-OK-12	1	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
	3	—	—	—	—	—	1	1	—	—	—	0	—	—	—	—	0
45-OK-18	1	—	—	—	—	—	—	0	—	—	1	1	—	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	0	1	—	—	—	1
45-OK-30	1	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
45-OK-38	1	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
45-OK-158	1	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
45-OK-168	1	—	—	—	—	—	—	0	—	—	—	0	1	—	—	—	1
	2	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
45-OK-226	1	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0
45-OK-229	1	—	—	—	—	—	—	0	—	—	—	0	—	—	—	—	0

SITE	Component	Rodents: Peromyscus sp.	Thomomys sp.	Citellus sp.	Perognathus sp.	Eutamias sp.	Neotoma sp.	Lagurus sp.	Microtus sp.	Unidentified	Sub-total	TOTAL
45-DO-262	1	—	—	—	—	—	—	—	—	—	0	0
45-DO-265	1	—	—	—	—	—	—	1	—	—	1	1
45-DO-273	1	—	2	—	—	—	—	—	—	—	2	2
	2	—	—	—	—	—	—	—	—	—	0	1
	3	—	—	—	—	—	—	—	—	—	0	1
45-DO-276	1	—	2	—	1	—	—	—	3	2	8	76
45-DO-282	1	—	34	1	—	—	—	—	—	—	35	39
	2	—	14	—	—	—	—	—	—	—	14	16
	3	—	4	—	—	—	—	—	—	—	4	9
	4	—	9	—	—	—	—	—	—	1	10	18
45-DO-284	1	—	2	—	1	—	—	—	—	—	3	8
45-DO-285	1	—	—	—	—	—	—	—	—	—	0	0
	2	—	2	—	—	—	—	2	2	—	6	36
45-DO-312	1	—	—	—	—	—	—	—	—	—	0	0
	2	1	—	—	—	—	—	—	—	—	1	1
45-DO-325	1	—	4	2	—	—	—	—	1	—	7	40
45-OK-2A	1	—	4	—	—	—	—	—	—	—	4	9
	2	—	1	—	—	—	—	—	—	—	1	14
45-OK-11	1	—	12	1	4	—	—	—	—	—	17	478
	2	—	—	—	22	—	—	—	—	—	22	62
45-OK-12	1	—	—	—	—	—	—	—	—	—	0	29
	2	—	—	—	—	—	—	—	—	—	0	18
	3	—	—	—	—	—	—	—	—	1	1	26
45-OK-18	1	—	—	—	—	—	—	—	—	—	0	2
	2	—	—	—	—	—	—	—	—	—	0	2
45-OK-30	1	—	2	—	—	—	—	—	—	—	2	59
45-OK-38	1	—	—	—	—	—	—	—	—	—	0	0
45-OK-158	1	—	—	—	—	1	—	—	—	—	1	9
45-OK-168	1	—	—	—	—	—	—	—	—	—	0	18
	2	—	—	—	—	—	—	—	—	—	0	8
45-OK-226	1	—	—	—	—	—	—	—	—	—	0	0
	2	—	—	—	—	—	—	—	—	—	0	6
45-OK-229	1	—	—	—	—	—	—	—	—	—	0	2

* Ovis aries (Domestic sheep)

Table C-1 (Continued)

SITE	Component	Large Herbivores: Odocoileus sp.	Cervus elaphus	Antilocapra sp.	Ovis canadensis	Bison bison	Unidentified	Sub-Total	Small Herbivores: Lepus sp.	Sylvilagus sp.	Marmota sp.	Castor sp.	Ondatra sp.	Unidentified	Sub-total
45-OK-239	1	11	—	—	3	—	26	40	—	—	—	—	—	—	0
	2	4	—	—	—	2*	3	9	—	—	—	—	—	—	0
45-OK-244	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-245	1	1	—	—	—	—	2	3	—	—	—	—	—	—	0
45-OK-246	1	—	—	—	—	—	14	14	—	—	—	—	—	—	0
45-OK-247	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-248	1	—	—	—	—	—	13	13	—	—	—	—	—	—	0
	2	1	—	—	—	—	16	17	—	—	—	—	—	—	0
45-OK-250	1	1	—	1	—	—	12	14	—	—	—	—	—	—	0
	2	8	1	—	5	—	55	69	—	—	—	—	—	—	0
	3	5	—	—	—	—	25	30	—	—	—	—	—	—	0
	4	—	—	—	—	—	8	8	—	—	—	—	—	—	0
45-OK-253	1	2	1	—	—	—	41	44	—	—	—	—	—	—	0
	2	—	—	—	—	—	9	9	—	—	—	—	—	—	0
45-OK-254	1	1	—	1	—	—	—	2	—	—	—	—	—	—	0
	2	1	—	—	—	—	2	3	—	—	—	—	—	—	0
45-OK-255	1	4	—	—	—	—	24	28	—	—	—	—	—	—	0
	2	—	—	—	—	—	19	19	—	—	—	—	—	—	0
45-OK-256**	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45-OK-257	1	25	1	3	11	—	35	75	—	—	2	—	—	—	2
	2	8	—	—	—	—	11	19	—	—	—	—	—	—	0
45-OK-258	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	4	2	—	—	—	3	9	—	—	—	—	—	—	0
	3	11	—	1	—	—	15	27	—	—	—	—	—	—	0
	4	—	—	1	—	—	1	2	—	—	—	—	—	—	0
45-OK-259	1	—	—	—	—	—	1	1	—	—	—	—	—	—	0
45-OK-261	1	—	—	—	—	—	2	2	—	—	—	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	—	—	1	1
45-OK-264	1	1	—	—	—	—	1	2	—	—	—	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-265	1	2	—	—	—	—	—	2	—	—	—	—	—	—	0

SITE	Component	Carnivores: Canis sp.	Taxidea sp.	Felis sp.	Lynx sp.	Martes sp.	Unidentified	Sub-total	Fish: Salmonidae	Non-salmonidae	Unidentified	Sub-total
45-OK-239	1	—	—	—	—	—	—	0	—	—	—	0
	2	—	—	—	1	—	—	1	1	—	—	1
45-OK-244	1	—	—	—	—	—	—	0	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	0
45-OK-245	1	—	—	—	—	—	—	0	—	—	—	0
45-OK-246	1	—	—	—	—	—	—	0	—	—	—	0
45-OK-247	1	—	—	—	—	—	—	0	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	0
45-OK-248	1	—	—	—	—	—	—	0	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	0
45-OK-250	1	—	—	—	—	—	—	0	—	—	7	7
	2	—	—	—	—	—	—	0	11	—	5	16
	3	—	—	—	—	—	—	0	—	—	1	1
	4	—	—	—	—	—	—	0	—	—	—	0
45-OK-253	1	1	—	—	—	—	—	10	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	0
45-OK-254	1	—	—	—	—	—	—	0	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	1	1
45-OK-255	1	—	—	—	—	—	—	0	1	—	—	1
	2	—	—	—	—	—	—	0	—	—	3	3
45-OK-256**	1	—	—	—	—	—	—	—	—	—	—	—
	2	—	—	—	—	—	—	—	—	—	—	—
45-OK-257	1	1	—	—	—	—	—	1	9	—	4	13
	2	—	—	—	—	—	—	0	1	—	4	5
45-OK-258	1	—	—	—	—	—	—	0	—	—	—	0
	2	—	—	4	—	—	—	4	—	—	—	0
	3	—	—	—	—	—	—	0	—	—	—	0
	4	—	—	—	—	—	—	0	—	—	—	0
45-OK-259	1	—	—	—	—	—	—	0	—	—	—	0
45-OK-261	1	—	—	—	—	—	—	0	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	0
45-OK-264	1	—	—	—	—	—	—	0	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	0
45-OK-265	1	—	—	—	—	—	—	0	—	—	—	0

SITE	Component	Reptiles/Amphibs.: Chrysemys sp.	Crotalus sp.	Bufo sp.	Unidentified	Sub-total	Rodents: Peromyscus sp.	Thomomys sp.	Citellus sp.	Perognathus sp.	Eutamias sp.	Neotoma sp.	Lagurus sp.	Microtus sp.	Unidentified	Sub-total	TOTAL
45-OK-239	1	—	—	—	—	0	—	1	—	—	—	—	—	—	—	1	41
	2	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	11
45-OK-244	1	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
	2	1	—	—	—	1	—	—	—	—	—	—	—	—	—	0	1
45-OK-245	1	—	—	—	—	0	—	5	—	—	—	—	—	—	—	5	8
45-OK-246	1	—	—	—	—	0	—	5	—	—	—	—	—	—	—	5	19
45-OK-247	1	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
	2	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
45-OK-248	1	—	—	—	—	0	—	2	—	4	—	—	—	—	1	7	20
	2	—	—	—	—	0	—	3	—	1	—	—	—	—	—	4	21
45-OK-250	1	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	21
	2	2	—	—	—	2	—	2	—	1	—	—	—	—	—	3	90
	3	1	—	—	—	1	—	—	—	1	—	—	—	—	—	1	33
	4	1	—	—	—	1	—	—	—	—	—	—	—	—	—	0	9
45-OK-253	1	3	—	—	—	3	—	8	—	—	—	—	—	—	—	8	56
	2	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	9
45-OK-254	1	—	—	—	—	0	—	1	—	—	—	—	—	—	—	1	3
	2	—	—	—	—	0	—	1	—	—	—	—	—	—	—	1	5
45-OK-255	1	—	—	—	2	2	—	5	—	—	—	—	—	—	—	5	36
	2	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	22
45-OK-256**	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45-OK-257	1	4	—	—	—	4	—	1	—	—	—	—	—	—	—	1	96
	2	1	—	—	—	1	—	—	—	—	—	—	—	—	2	2	27
45-OK-258	1	—	—	—	—	0	—	1	—	—	—	—	—	—	—	1	1
	2	—	—	—	—	0	—	—	—	1	—	—	—	—	—	1	14
	3	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	27
	4	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	2
45-OK-259	1	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	1
45-OK-261	1	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	2
	2	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	1
45-OK-264	1	—	—	—	—	0	—	6	—	1	—	—	—	—	—	7	9
	2	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
45-OK-265	1	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	2

* Bos sp. (Domestic cow)   ** Not Classified

Table C-1 (Continued)

SITE	Component	Large Herbivores: Odocoileus sp.	Cervus elaphus	Antilocapra sp.	Ovis canadensis	Bison bison	Unidentified	Sub-Total	Small Herbivores: Lepus sp.	Sylvilagus sp.	Marmota sp.	Castor sp.	Ondatra sp.	Unidentified	Sub-total	Carnivores: Canis sp.	Taxidea sp.	Felis sp.	Lynx sp.	Martes sp.	Unidentified	Sub-total
45-OK-274	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	9	—	—	—	—	9	18	—	—	1	—	—	—	1	—	—	—	—	—	—	0
	3	11	—	1	—	—	19	31	—	—	1	—	—	—	1	—	—	—	—	—	—	0
45-OK-275	1	11	—	—	—	—	17	28	2	—	—	—	—	—	2	1	—	—	—	—	—	1
	2	9	—	—	—	—	14	23	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	3	—	—	—	—	—	3	3	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-280	1	—	—	—	—	—	3	3	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	2	—	—	—	—	7	9	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	3	—	—	—	—	—	—	0	—	—	—	—	—	—	0	1	—	—	—	—	—	1
45-OK-287	1	—	—	—	—	—	3	3	—	—	1	—	—	1	2	—	—	—	—	—	—	0
45-OK-288	1	2	—	—	—	—	13	15	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	2	—	1	—	—	9	12	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	3	—	—	—	—	—	3	3	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-289	1	—	—	—	—	—	1	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-292	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	—	—	—	1	—	2	3	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	3	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-303	1	—	—	—	—	—	1	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-309	1	—	—	—	—	—	1	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	—	—	—	—	—	1	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-310	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	6	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-311	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-312	1	3	—	—	—	—	—	3	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-313	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	2	—	—	—	—	—	2	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	6	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-314	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-340	1	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0
45-OK-347	1	—	—	1	—	—	9	10	—	—	—	—	—	—	0	—	—	—	—	—	—	0
	2	—	—	—	—	—	3	3	—	—	—	—	—	—	0	—	—	—	—	—	—	0
TOTAL		374	12	20	30	18	1233	1687	6	6	57	6	1	3	79	5	1	4	1	1	3	15

SITE	Component	Fish: Salmonidae	Non-salmonidae	Unidentified	Sub-total	Reptiles/Amphibs.: Chrysemys sp.	Crotalus sp.	Bufo sp.	Unidentified	Sub-total	Rodents: Peromyscus sp.	Thomomys sp.	Citellus sp.	Perognathus sp.	Eutamias sp.	Neotoma sp.	Lagurus sp.	Microtus sp.	Unidentified	Sub-total	TOTAL
45-OK-274	1	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
	2	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	19
	3	2	—	—	2	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	34
45-OK-275	1	—	—	—	0	—	—	—	—	0	—	1	—	2	—	1	—	—	—	4	35
	2	—	—	—	0	—	—	—	—	0	1	5	—	1	—	—	—	—	—	7	30
	3	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	3
45-OK-280	1	1	—	—	1	1	—	—	—	1	—	—	—	—	—	—	—	—	—	0	5
	2	1	—	—	1	—	—	—	2	2	—	—	—	2	1	—	—	—	—	3	15
	3	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	1
45-OK-287	1	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	5
45-OK-288	1	—	—	—	0	—	—	—	—	0	—	—	—	1	—	—	—	—	—	1	16
	2	2	—	—	2	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	14
	3	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	3
45-OK-289	1	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	1
45-OK-292	1	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
	2	—	—	—	0	—	—	—	—	0	—	1	—	1	—	—	—	—	—	2	5
	3	—	—	3	3	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	3
45-OK-303	1	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	1
45-OK-309	1	—	—	—	0	6	—	—	—	6	—	—	—	—	—	—	—	—	—	7	0
	2	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	1	0
45-OK-310	1	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
	6	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
45-OK-311	1	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
	2	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
45-OK-312	1	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	3	0
	2	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
45-OK-313	1	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
	2	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	2	0
	6	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
45-OK-314	1	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
45-OK-340	1	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	0
45-OK-347	1	—	—	—	0	—	—	—	—	0	—	—	—	1	—	—	—	—	—	1	11
	2	—	—	—	0	—	—	—	—	0	—	—	—	—	—	—	—	—	—	0	3
TOTAL		78	9	50	137	40	1	1	9	51	2	207	7	53	2	1	3	10	6	293	2262

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